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## THE MIGRATORY IMPULSE VS. LOVE OF HOME.

By LINUS W. KLINE, Fellow in Psychology, Clark University.

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### INTRODUCTION.

The migration of animals and peoples, the wandering of tribes and roving impulse of the individual, have been woven into legends and myths, carved upon stone and written upon parchment, ever since the advent of human thought.

The predatory advance of the locust,<sup>1</sup> the measured flight of certain butterflies,<sup>2</sup> the martial like procession of caterpillars and ants<sup>3</sup> have long inspired wonder, superstition and thought, "The 'human race is more concerned in the movements and migrations of fish than in the question of their permanent abode.'" To the ancients the flight of birds was a token of prosperity or adversity according to the direction of the flight. If an eagle flew over from left to right or from right to left, the former was regarded a good omen, the latter an evil one. Among the hieroglyphs on the monuments of the Pharaoh's are represented wild-goose fowling as these birds were making their annual migrations through the Nile Valley. The <sup>4</sup>prophet Jeremiah in rebuking the seared consciences of the Jews, spoke in this fashion: Yea, the stork in the heavens knoweth her appointed times and the turtle and the crane and the swallow observe the time of their coming; but my people know not the judgment of the Lord.

The folk-lore of many tribes, the beginnings of many great

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<sup>1</sup> Figuiet : The Insect World. Page 302.

<sup>2</sup> Couch : Illustrations of Instinct, pp. 145-150.

<sup>3</sup> Huber : Ants.

<sup>4</sup> Baird, Spencer F : U. S. Fish Com. Report, 1886, p. 47.

<sup>5</sup> Jeremiah 8 : 7.

nations in addition to historical facts, consist of migratory legends and myths of wandering.

The tradition of the Hebrew, which tells of their migration into Palestine from the countries across the Euphrates, is substantiated by their tribal name, *ibri*, *i. e.*, one who has crossed. The Doric traditions of an immigration from Thrace and Macedonia through Epirus into Greece is confirmed by linguistic facts. The legendary account of the migration of Cadmus, leading to the foundation of Thebes, the checkered and wandering life of Æneas, previous to his marriage and settling in Italy, the adventurous and romantic journey of Ulysses from Troy to Ithaca have given to literature its classic wanderers for all time.

All tribes of the Maskoki stock of Indians,<sup>1</sup> likewise the Washoe around Carson City and Tinne-Appache of New Mexico possess migration legends intermingled with myths and mythic ideas. Many of the <sup>2</sup>Polynesian tribes have similar traditions.

In recent times Germany and Austro-Hungary have established stations for observing bird migration. Scientists of Great Britain utilize part of her lighthouse service for collecting data on bird movements. In our own country many men of the weather bureau service have divided their time between observing weather phenomena and collecting data on the flight of birds.

Several attempts<sup>3</sup> have been made by naturalists and anthropologists<sup>4</sup> to trace out the migrations.<sup>5</sup> of man from his <sup>6</sup>primitive home until he had peopled the whole earth. Journalism<sup>7</sup> has recently given some space to accounts of roving and tramp<sup>8</sup> life. Within the past two years some systematic study has been devoted to Truancy,<sup>9</sup> chiefly<sup>10</sup> along statistical, sociological and anthropometrical lines.

The writer was brought face to face with this instinct while in conversation with a few of the beneficiaries of the associated

<sup>1</sup>Gatschet, A. S.: A Migratory Legend of the Creeks, p. 218, Phil. 1884.

<sup>2</sup>Sittig, Otto: Compulsory Migrations in the Pacific Ocean. Smith. Report, 1895, pp. 519-35.

<sup>3</sup>Sittig Otto: *loc. cit.*

<sup>4</sup>Mason, O. F.: Amer. Anthro., Vol. II, No. 3, 1894, Migration and the Food Quest.

<sup>5</sup>Brinton, G. D.: Races and People.

<sup>6</sup>Müller, Friedrich: Allgemeine Ethnographie.

<sup>7</sup>Noble, C. W.: Border Land of Trampdom. Pop Sci. Month, Vol. L, p. 252.

<sup>8</sup>Flynt, Josiah: Century Vols. XXIV and XXV, 1893. Same author in Atlantic Month. Vol. LXXVII, p. 88.

<sup>9</sup>Fifty-ninth Annual Report, Board of Ed. of Mass.

<sup>10</sup>*Pedagogical Seminary*, Vol. V, No. 3, 1898.

charities of Boston. A description of one will suffice, for in respect to this trait they differed but little.

A young man of American parentage who had just recovered from a spell of sickness in a Boston hospital presented himself to the manly department of the association asking for money to purchase a ticket to Springfield, Mass. He seemed very anxious to get work again and had a strong hope that he could do so were he only in Springfield. He produced evidence showing that he was a skilled workman and had given satisfaction to his employers. It was found that he had come from New York and to New York he had gone from Springfield, Mass., to which latter place he now longed to return, though he had neither home nor relatives in the place. He had paid his respects to each of these four cities within five months. No particular reason could he assign for leaving any one place, except that he thought a change was good for him. After remaining a certain length of time in a place, familiar objects and places became distasteful, even the odors of the shop would haunt him and at times the very sight of shop comrades would appear repulsive. Peace of mind came only by breaking away and entering into the life of a new place. He recognized painfully that it was not the way to provide for a rainy day nor to become a practical citizen.

Says Flynt: "I have known men on the road who were tramping purely and simply because they loved to tramp. They had no appetite for liquor or tobacco, so far as I could find, also were quite out of touch with criminals and their habits; but somehow or other they could not conquer that passion for roving. In a way this type of vagabond is the most pitiful that I have ever known; and yet is the truest type of the genuine voluntary vagrant. . . . To reform him it is necessary to kill his personality, to take away his ambition and this is a task almost superhuman. Even when he is reformed he is a most cast down person."

"Ten<sup>2</sup> years ago four young men of this city took a pedes-

<sup>1</sup>Flynt, Josiah: *Century*, Oct., 1885, p. 941.

<sup>2</sup>One of over 500 cases taken from Rubrics II and IV. See Syllabus below.

### TOPICAL SYLLABI FOR CHILD STUDY.

(Series for Academic Year 1896-7).

#### III. MIGRATIONS, TRAMPS, TRUANCY, RUNNING AWAY, ETC., vs. LOVE OF HOME.

I. Consider whether you know any small child with a propensity to run away; and if so describe the circumstances—why, when, where it went, whether alone, and planned, or impulsively, and all the details and incidents of each case; its adventures, how it was found,



trian trip to the Delaware Water Gap. They were all of good families and of excellent habits. On returning home three of them resumed their every-day life, but F., who was about twenty years old, after staying home several days disappeared and did not return for several weeks. When he came back he told the alarmed family that he had been on another tramp. Since that time he has been all over the United States working only when he could not obtain food or lodging otherwise. He returns home at intervals but stays only for a few days, and does not appear to have formed any bad habits, but cannot overcome the desire to wander. He still seems to have affection for those at home, yet cannot content himself to stay with them. As none of his relatives have led adventurous lives, his parents cannot account for his strange behavior."

whether deterred later by its experiences, at what age this disposition appeared and when it ceased and why.

II. Describe the same with boys and girls in their teens, who leave home for love of adventure, anger, impatient of restraint, to start life for self, etc., definite plans or none. Give every incident of cause, experiences, hardships, etc., you can find out.

III. Describe any case of truancy from school or church, its motives, traits of the child, mode of concealment.

IV. In your own experience what are the charms of travel in order of interest, whether of a trip to Europe, a ride or bicycle journey, a lonely walk of a day's duration, globe-trotting, etc. Have you ever left home aimlessly, and before leaving had you lost property and friends or been injured in feelings? Have you been tempted to "disappear," and what reasons, or left home to "do the world" or "paint the town?" Have you ever suffered intense hunger, and if so describe your feelings.

V. What do you know of tramps? have you ever interviewed one, or can you do so? what have you ever read or heard of them?

VI. Do you know people who move frequently, and if so, state why, where, how often and all you know of them.

VII. Do you know anything of gypsies or can you find out anything?

VIII. Do you know an inveterate visitor, call-maker, gad-about person, who must be always on the street or on the go? If so describe them carefully, and see if you can account for it; or of boys with a passion to start out for themselves exceptionally early in life.

IX. The same of any one who loves home so intensely that he or she will only very reluctantly go away for, or be away nights.

X. What are the elements in your own love of home in order—as love of father, mother, brother, sister, the house, hills, trees, and natural scenery, familiar ways of life, etc.

XI. Describe any case of homesickness you know of and especially if you have experienced it yourself.

XII. Describe your own experiences with spring fever, ennui that impelled you to go or be far away, longings in the distance, desire to break away and see the great world and take a part in its actions. Have you ever felt thus concerning a future life as connected with either *religion, love or conflict*?

In each case specify each of the following points: 1, age; 2, sex;

Here, then, is an activity of the soul, woven into legends and folk-lore, is discussed in history and science, and affects profoundly the social and domestic life of a people. An instinct that destroys for the time being even the activities that provide for the immediate wants of life, that drives out considerations for home, relatives and friends, that overpowers the sympathetic, the domestic, the home-making spirit of man, that unfits him for static toil and conditions, and impels him to seek a change, the new, strange and untried.

Modern biology in its interpretation of *form and function* begins its work with the undifferentiated organ or organism in question, and follows it through its phylo-ontogenetic developing paths, both by the methods of experimental morphology and comparative anatomy until present conditions are reached. The verdict of these methods, especially the former, is that the efficient causes in the process are first,<sup>1</sup> "internal causes,

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3, nationality; 4, occupation of parents; 5, are one or both living? 6, do they own their homes? 7, is their food and clothes good? 8, toys; 9, books; 10, pin-money; 11, affections; 12, has the child any physical defects? 13, is it oldest, youngest or only child? 14, is it quick-tempered? 15, sensitive; 16, demonstrative; 17, laugh and cry easily; 18, cheerful; 19, active; 20, generous; 21, fond of playmates or reticent and inclined to be alone; 22, does it seek to govern others and does it obey readily? 23, love or shun crowds; 24, or dark; 25, animals; 26, deep water; 27, out of door life, fondness for woods, fields, etc.; 28, does it love music, does it dance? 29, a good color sense, and what are its favorite colors? 30, is it careless or tidy and dressy? 31, has it had pets, is it good to animals? 32, careful of property; 33, and of others' rights; 34, made a collection of things; 35, is it persistent in carrying out tasks? 36, is it inquisitive and talkative? 37, were there ample opportunities for taking exercise, were games and sports encouraged? 38, was there plenty of physical or manual labor at home? 39, must there have been long hours of sedentary work at home and in school? 40, *always specify the season of the year of every incident if possible*; 41, was their immoderate love of sight-seeing, being out evenings, camping out, hunting, excursions, picnics, etc.?

XIII. What have you observed concerning the migrations and the homing instincts of animals, cats, dogs, cows, horses, hens, rabbits, pigeons, fish, ducks, etc., etc.? What have you read, and can you send or refer to any literature or reports of cases? What have you observed of any lower forms of life that move freely at first and then become sessile or fixed as parasites, of nuptial flights of insects?

XIV. What special literature can you refer to on tramps, homesickness, truancy, gypsies or on any other aspect of this topic?

In any case giving the full name of any part of it is optional with the one answering.

Kindly send your answers to

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or L. W. KLINE.

CLARK UNIVERSITY,  
Worcester, Mass., Oct. 26th, 1896.

<sup>1</sup> Davenport, C. B.: Experimental Morphology, Part I, p. 8.

which include the qualities of the developing protoplasm ;" second, "external causes, which include the chemical and physical properties of the environment in which the protoplasm is developing."

The genetic psychologist has taken his cue from the biologists, and accordingly—after making certain assumptions, a feature common to all sciences, concerning the relations of mind<sup>1</sup> and body,<sup>2</sup> heredity and the like, unnecessary to discuss here—goes back to primitive psychic life, and investigates both the causes and the processes in its development until it reaches conditions found in the adult form. The factors believed to be operative in originating and determining the causes of psychic differentiation are (1) those inherent in the *principle life* itself ; (2) *cosmic*, including chemical substances, moisture, heat, pressure, light and electricity, and their innumerable combinations and ever changing relations to each other and to *life* ; and (3) *social*, meaning by the latter all those influences that proceed from members of the same family, tribe and species, together with all other species, both plants and animals. Dr. Brinton<sup>3</sup> writing on the role played by social influences in psychical differentiation says : "The psychical development of men and nations finds its chief explanation, less in the natural surroundings, the climate, soil, and water currents, as is taught by some philosophers, than in their relations and connections with each other, their friendships, federations and enmities, their intercourse in commerce, love and war." To present the point of view of the present investigation, to sensitize our minds as to the delicacy of the interaction between cosmic forces and life, and the nature of the latter's response, I propose to give, very briefly, indeed, the results of some experiments and observations on temperature,<sup>4</sup> one of the most vital forces operating on organic life.

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<sup>1</sup> "The process of psychical evolution runs parallel with the evolution of organic life." Paulsen: Introduction to Philosophy, p. 143.

<sup>2</sup> "The key-note of modern biology is evolution ; and on the hypothesis of scientific monism here adopted. . . . We are not only logically justified in extending our comparative psychology so as to include within its scope the field of zoölogical psychology, but we are logically bound to regard psychological evolution as strictly co-ordinate with biological evolution." Lloyd Morgan: Introduction to Comparative Psychology, pp. 36-37.

<sup>3</sup> Brinton, G. D.: *loc. cit.*

<sup>4</sup> It should be remembered that temperature is only one among many determining developmental factors, and that what is presented here is merely a type of a large number of studies made on the behavior of protoplasm in the presence of chemicals, density of fluid medium, gravity, electricity and light. Doubtless the most comprehensive modern works of experimental morphology are Loeb's Untersuchungen z. Physiologischen Morphologie, d. Thiere, 1892 ; M. Verworn's Allgemeine Physiologie, 1895 ; and C. B. Davenport's Experimental Morphology, 1897.

*What quantitative limitations does temperature impose upon life?*

The range of life in temperature is less than  $100^{\circ}$  of the temperature scale. "So<sup>1</sup> delicate is the adjustment between living matter and the conditions by which it is environed that if the mean temperature of the earth were raised or lowered through only a few dozen degrees, the teeming creatures of air, water and land, would cease to exist." Upon this point Professor Shaler<sup>2</sup> observes: "The range of heat which life can sustain may be taken as less than  $100^{\circ}$ ; but in the sun we have a temperature which cannot well be estimated as less than a hundred thousand degrees Fahrenheit, and in the depth of the earth is probably to be measured by tens of thousands of degrees on that scale, while in the realm of ether between the solar and terrestrial spheres there is a degree of cold which is certainly to be reckoned as some hundreds of degrees below zero. Amid these contending extremes of heat and cold life must find its narrow place." If these inconceivably large numbers be expressed in linear terms, we have a line one hundred thousand inches in length, an extension of about one mile and a half, let the space of each inch represent one degree Fahrenheit. On that scale mark off a space of eight feet near one end and this trifling part of the length of the whole line gives us a diagrammatic representation of the ratios between the temperatures of the solar system and those in which organic life can be maintained. This delicate adjustment of life to temperature is clearly expressed by spatial limitations. "It is highly probable that at no time since the beginning of life in the unstable material forms as we know it, has temperature conditions necessary for life existed much over five miles above the level of the sea even at the equator."

*Relations of life to temperature considered experimentally.* The casual observer knows that fowls droop their wings, that swine hunt the wallow and the ox the shade of the oak in hot weather. Every farmer, gardner and florist knows well that the effectiveness of the hot-bed and green-house in producing vigorous, healthy plants, depends upon a very narrow range of temperature.

The experimental investigations of Velten,<sup>3</sup> Kerner,<sup>4</sup> Mendelssohn,<sup>5</sup> Verworn,<sup>6</sup> Loeb<sup>7</sup> and others show quantitatively the

<sup>1</sup> McGee: Anthropological Society, Washington, D. C., 1894.

<sup>2</sup> Shaler, N. S.: Interpretation of Nature, pp. 67, 68-117.

<sup>3</sup> Velten. Quoted by Davenport: Experimental Morphology, pp. 226-227, 1897.

<sup>4</sup> Kerner: The Natural History of Plants, Vol. I, pt. 2, pp. 557-8. (Tr. by Oliver.)

<sup>5</sup> Mendelssohn: Archiv. fur die ges. Phys., Band 60, 1895.

<sup>6</sup> Verworn: Allgemeine Physiologie.

<sup>7</sup> Loeb: Untersuchungen z. Phys. Morphologie, d. Thiere.

exceeding sensitiveness of protoplasm to temperature. Englemann,<sup>1</sup> Edward,<sup>2</sup> Mendelssohn, Cambell,<sup>3</sup> Davenport, have demonstrated that in general protoplasm is more responsive the closer we approach its optimum temperature—a temperature of about 30°C.

A more direct line of evidence showing the relation of the activities of protoplasm to temperature is found in the fact that organisms, in general, absorb more oxygen and excrete more carbon dioxide the higher the temperature within certain limits.

This has been sufficiently proven by the germination and growth of seedlings,<sup>4</sup> by the increase of rhythmic movements of the contractile vacuole of infusoria in rising temperature.<sup>6</sup> Numerous<sup>6</sup> experiments on air breathing<sup>7</sup> animals confirm the same general law, and, furthermore, establish a relationship<sup>8</sup> between the oxygen absorbed and the carbon dioxide given off. But nowhere do I find experimental evidence on the quantitative differences between either the absorption of oxygen or the excretion of carbon dioxide at the optimum of an organism and at temperatures above and below that point.

I present here in detail a series of experiments carried out on tadpoles<sup>9</sup> with a view to gain some evidence on this problem. The first<sup>10</sup> part of the problem was to ascertain

<sup>1</sup> Englemann, Th. W.: Flimmeruhr u. Flemmermühle Zwei, App. Z. Register d. Flemmerbewegung. Pflüger Archiv. f. Phys., pp. 501-502, Vol. XV, 1877. (See Fig. 1 and F. af 6.)

<sup>2</sup> Edward, Chas. L.: Stud. Biol. Lab. Johns Hopkins Univ., Vol. IV, 1888, pp. 19-35.

<sup>3</sup> Campbell: Stud. Biol. Lab. Johns Hopkins Univ., Vol. IV, pp. 123-145.

<sup>4</sup> Vine, S. H.: Physiology of Plants, p. 198. (See table.)

<sup>5</sup> "From all these facts we may conclude that, within certain limits, an increase of temperature increases metabolism, and a diminution of temperature diminishes it." Davenport: Experimental Morphology, p. 225.

<sup>6</sup> Regnault et Reiset: Recherches chimiques sur la respiration des Animaux des diverses classes. Annales de chimie et Physique, pp. 299 et seq.; 3me Ser; Tome 26, 1849.

<sup>7</sup> Colosanti: Ueber den Einfluss der umgebenden temperatur auf den Stoff wechsel der Warmblütes Pflüger. Arch., Vol. XIV, pp. 92, 469, 1877.

<sup>8</sup> Page: External Temperature Affecting the Amount of CO<sub>2</sub>, etc., *Jour. of Phys.*, Vol. II, p. 228, 1879-'80.

<sup>9</sup> I chose this form of animal because it lends itself readily to a variety of experiment with comparatively simple apparatus, and also on account of its delicate and ready response to changes of environment.

<sup>10</sup> For this purpose a zinc trough 20cm deep, 16cm wide and 2.3 meters long, supported by a wooden frame, was constructed. To the bottom of the trough 16cm from one end a tin box 12cm wide, 15cm long and 6cm deep was soldered. The box received water through a hole cut in the zinc. Water was conducted to the hole through a stand pipe soldered to the inside bottom of the trough. The tin box served two purposes: first, it admitted a direct application of the

whether or not the tadpole will choose voluntarily his optimum.<sup>1</sup>

(1) Sixty-seven tadpoles were placed in the middle of the rectangular trough, the temperature of the water being 4°C throughout. They leisurely distributed themselves equally throughout its whole extent. Heat was now applied to the left end, the right end resting on iced sawdust. When the left end reached 16°C the tadpoles began to congregate in that region, and especially about the standpipe. No one remained very long in any one place, though they did not appear at all uncomfortable. Each movement was attended by a leisurely indifferent motion of the tail, as if the rising temperature was a source of comfort. The temperature at the right end at this moment was 6°C, containing only a few tadpoles which seldom moved. At 20°C the left end was crowded, thus showing that for that temperature they are positive thermotactic. At 24°C the tadpoles showed marked discomfort. The movements were no longer of an indifferent lazy waggle, but were decided and quick, showing that they were beginning to experience uncomfortable quarters. As yet, however, there were no movements in a definite direction. Between 25°C-26°C migrations began toward the right end, which had risen to a temperature of 15°C. At 27°C migrations to the right end were continuous, and at times not a single creature remained in the region of the left end. Tadpoles occupying an intermediate position between the two ends, temperature 18°C, sniffing, as it were, a warmer region toward the left, frequently darted suddenly for it, only to find themselves in hot water, out of which they immediately migrated. The eight thermometers at twelve inches apart registered temperatures shown in Fig. I, Diagram 1. (2) When the temperature of the left end reached 36°C and the right end 26°C the heat was turned off. The left end was allowed to cool by the ordinary process of radiation into the air of the room, while the right was hastened by artificial means. When the latter had fallen to 18°C during 12 minutes, the left end registered 28°C, toward which, but not to it, a slow movement began and increased more and more as the temperature fell at both ends. When the left end had fallen to 24°C and the right

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flame to its surface, and thereby protecting the zinc bottom, and second, the water heated in this vessel transmitted its heat to the zinc over a surface equal to the area of the tin vessel; thus preventing an excessively high temperature in one spot, which would have resulted by a direct application of the flame. Depth of water in trough was two and one-half inches. A board strip containing one-quarter inch holes six inches apart was laid lengthwise of the trough. Thermometers were thrust through eight of these holes, and allowed to dip two inches below the surface of the water.

<sup>1</sup>A summary of these experiments appeared in *Ped. Sem.*, Vol. V, No. 3, 1898.

end to  $10^{\circ}\text{C}$  the migration toward the left were about complete. A few remained behind entangled in the ice, besides a few scattering ones at intermediate points, but the great bulk were huddled in together at the left end tadpole fashion. The cooling continued until both ends reached, respectively,  $18^{\circ}\text{C}$  and  $19^{\circ}\text{C}$ . The temperatures of the intermediate thermometers were noted and the number of creatures in the region of each counted, which is shown in Fig. II. This is a clear expression of negative thermotropism at temperatures below  $18^{\circ}\text{C}$ . Now, since they move away from a temperature of  $26^{\circ}\text{C}$  toward a lower one, and away from a temperature of  $18^{\circ}\text{C}$  toward a higher one, it is evident that there must be a temperature somewhere between these two points which is agreeable or most favorable for the tadpole—its optimum.

(3) The tadpoles were removed from the trough, and the left end was raised to  $35^{\circ}\text{C}$ , the other reduced to  $0^{\circ}\text{C}$ . Fifty fresh tadpoles were then put into the tank at a point registering  $10^{\circ}\text{C}$ . Within five minutes they took the position indicated in Fig. III. I removed them from the tank to a vessel containing water at  $12^{\circ}\text{C}$ —temperature in which they were then being kept, where they remained 45 minutes, after which they were transferred again to the tank and put in at a region registering  $26^{\circ}\text{C}$ . In a very short time the position indicated in Fig. IV were taken. The several temperatures were kept constant for ten minutes, during which time the number at the temperatures were counted, but at no time were the numbers materially changed from those already given. At times there was more or less moving, now toward the cooler region, now toward the warmer, but their little excursions nearly always ended in the region between  $19^{\circ}\text{C}$  and  $24^{\circ}\text{C}$ .

The conclusion is that the optimum for the tadpole is between  $19^{\circ}\text{C}$  and  $24^{\circ}\text{C}$ . This conclusion is supported by three other facts. (1) Their respiration curve rises very suddenly at  $24^{\circ}\text{C}$ . [See Chart I]. (2) The maximum amount of  $\text{CO}_2$  is produced between  $19^{\circ}\text{C}$  and  $24^{\circ}\text{C}$ . (3) Their refusal to eat in temperatures above  $24^{\circ}\text{C}$ . (They will eat, however, in temperature as low as  $10^{\circ}\text{C}$ ). The curves<sup>1</sup> of Chart I indicate the

<sup>1</sup> The apparatus consisted of a tall narrow glass jar, depth 28cm, and diameter 9cm. It was filled with water. The tadpoles were confined within narrow limits, and prevented from direct contact with the bottom of the glass jar by a partition spaced off by two circular pieces of wire gauze 8.5 in. diameter, placed horizontally in the jar 6.5cm apart. These two wire platforms were held *in situ* by a wooden rod thrust through their center and resting on the bottom of the jar, which was placed in a sheet-iron kettle containing five liters of water. The bottom of the glass jar was allowed to barely touch the surface of the water in the kettle. These conditions secured a slow and uniform rise in temperature. Two thermometers were placed at different levels within the space confining the tadpoles.

DIAGRAM I.

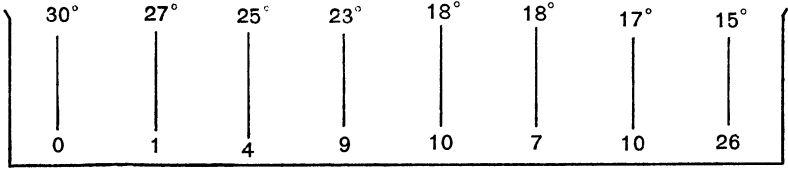
*Thermotropism of tadpoles.*

FIG. I.

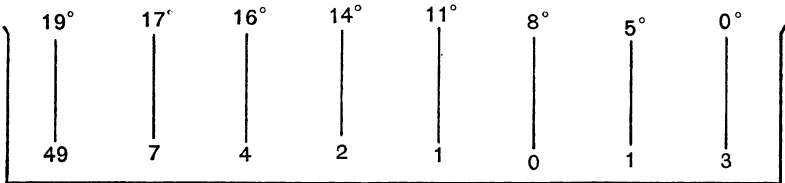


FIG. II.

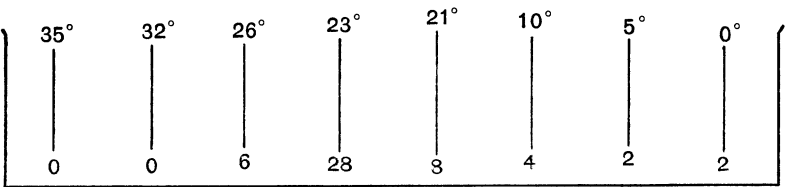


FIG. III.

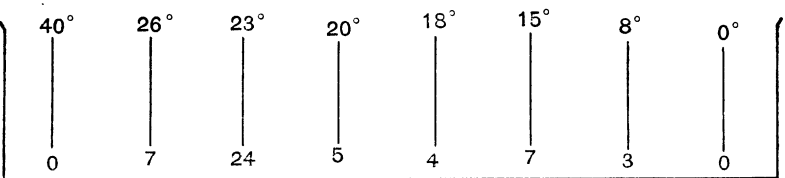


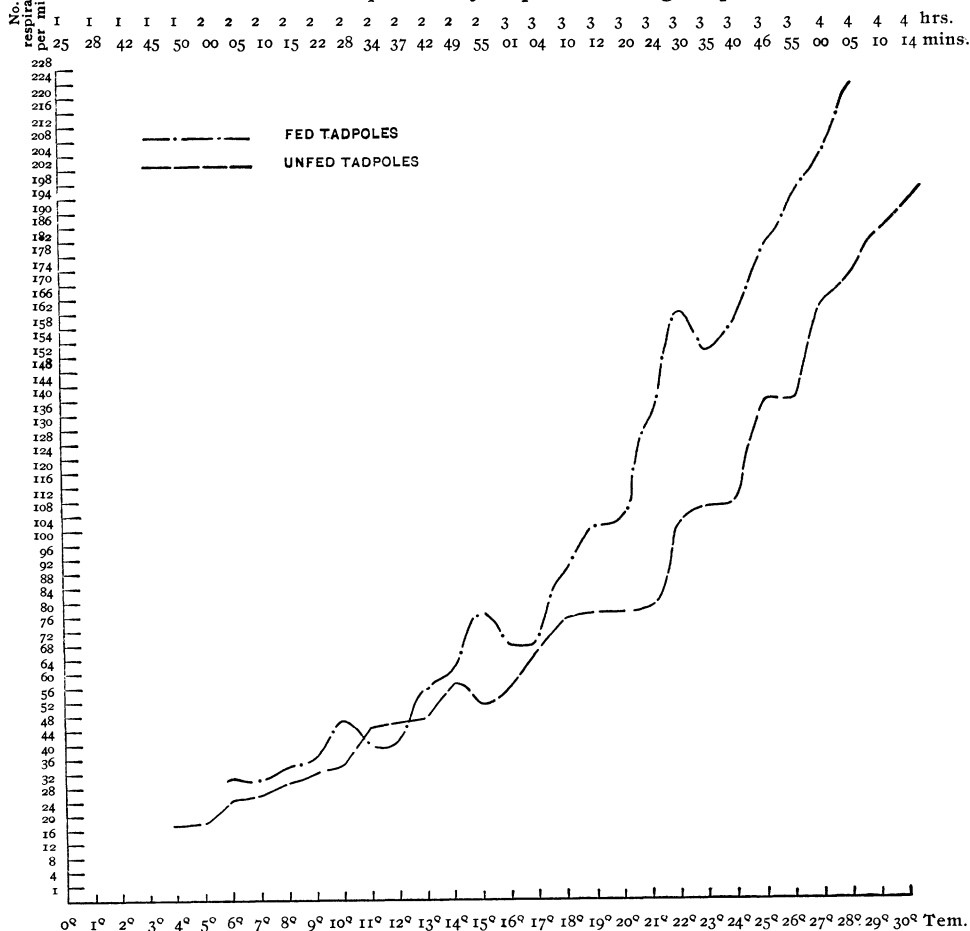
FIG. IV.

The vertical lines represent thermometers. The lower row of figures indicate the number of tadpoles in the region of different temperatures. The upper row of figures indicate temperature in degrees centigrade.



effect of rising temperature on the respiration of tadpoles. The temperature was raised from 0°c to 30°c in 165 minutes, or 1°c in 5.5 minutes. The lean, unfed tadpoles began to breathe at 4°c, those well-fed at 6°c. At these temperatures I was able to count from 20 to 24 respirations per minute. Often,

CHART I. *Respiration of tadpoles in rising temperature.*



however, no respiration could be detected below 5°c. From 5°c up to 20°c the increase is quite uniform. At 21°c the obese tadpoles increase their respiration 54 to the minute, the lean ones defer any sudden rise until 24°c. Divergence in their curves begin at 17°-18°c. Attention is called to the

fact that the increase in respiration from  $24^{\circ}\text{C}$  to  $30^{\circ}\text{C}$ , or through  $6^{\circ}\text{C}$  equals that from  $5^{\circ}\text{C}$  to  $24^{\circ}\text{C}$ , or the increase through  $19^{\circ}\text{C}$ . Thus showing that any increase of temperature above  $24^{\circ}\text{C}$  produces effects altered in character to those of like increments below that point. Another inference made here is that, since metabolism is a function of respiration (taught long ago by physiologists), and that the latter stands in causal relation to temperature, metabolism bears a vital relation to temperature. The second part of the problem was to enquire more closely into the nature of this relation. What is the quantitative difference between the metabolism at the optimum and at temperatures above and below that point, as indicated by carbon dioxide<sup>1</sup> produced at different temperatures?<sup>2</sup>

The determination of  $\text{CO}_2$  produced by air breathing animals is usually effected by aspirating the exhaled air over barium hydrate or a soda solution contained in Pettenkorf or U tubes. The difference in the weight of the tubes before and after the aspiration of the expired air is taken as the weight of  $\text{CO}_2$  produced after making certain corrections.

With water breathing animals the problem is more complex. Water is a solvent of carbon dioxide. The extent of the solvency depends on the temperature and pressure. In this instance the normal pressure was lessened by the aspirator employed to supply the water containing the tadpoles with oxygen. This diminution of pressure favored the escape of a portion of the carbon dioxide from the water. The problem narrowed into the estimation<sup>3</sup> of the carbon dioxide left in the water and of that which continually escaped into the tubes. The amount found in the former I have termed the "volumetric

<sup>1</sup> The inference that a quantitative determination of  $\text{CO}_2$  is a measurement of metabolism is based on the following well-known facts: "Oxygen is concerned with the integrating, the anabolic process, on the other hand carbon dioxide is one of its several disintegrating or katabolic products. These two constituents are not only always present in metabolic processes, but are of such prime importance to the process that a quantitative determination of either or both is a fair measure of metabolism itself." . . . Quoted from article on Truancy, *Ped. Sem.*, Vol. V, No. 3, p. 383. See same article for literature on the relation of O to  $\text{CO}_2$  in life processes, also Howell's American Text-book of Physiology for criticisms on the constancy of the ratio of the oxygen absorbed to carbon dioxide produced.

<sup>2</sup> It is not the purpose to determine the absolute amount of metabolism, such a task is some distance ahead present laboratory methods. The object here is to estimate the relative amounts at different temperatures, and regard these quantities as merely indices to what the absolute quantity may be at a given temperature.

<sup>3</sup> The apparatus consisted of a three mouthed glass jar, capacity seven liters. The jar was connected on one side with U tubing and a gas meter—the tubing was filled with pumice stone and concentrated sulphuric acid—and on the other with a series of seven U

TABLE I.  
Showing the amount of  $CO_2$  produced per hour per kilogram of Tadpole at different temperatures.

Experi- ment.	No. of tadpoles.	Time.	Air aspirated.	Weight of tadpoles in grammes.	Volumetric portion of $CO_2$ exhaled	Gravimetric portion of $CO_2$ exhaled	Weight of $CO_2$ pro- duced per hour.	Weight of $CO_2$ produced per hour per kilo- gram of animal.	Tempera- ture Cen- ti- grade.
No. 1,	10	5 hrs.	45.88 Liters.	91 G	.225 G	.1955 G	.08410 G	.924 Grams.	20°
" 2,	10	5 1½ "	" 43.7	93 G	.015 G	.1789 G	.03875 G	"	7°-8°
" 3,	10	5 "	" 43.14	98 G	.195 G	.2041 G	.07982 G	.814	15°
" 4,	10	4 1/8 "	" 65.71	98 G	.075 G	.2105 G	.06963 G	.71	26°-27°
" 5,	10	4 1/4 "	" 67.93	97 G	.120 G	.2074 G	.0770 G	.793	30°
" 6,	10	5 "	" 60.64	88 G	.180 G	.1980 G	.0756 G	.859	22°

<sup>1</sup>The tadpoles were in a high state of feeding, and undergoing rapid metamorphosing. Chapman and Brubaker have shown that in the case of two pigeons, one, fat and well fed, produced per hour twice as much  $CO_2$  as the second, poorly fed and lean in flesh. Further, Richet—Archiv. de Phys. Normale et Pathologique, 5th ser., Vol. II, pp. 17-30, 1890.—has shown that in the same species the quantity of  $CO_2$  exhaled is inversely proportioned to the body weight and directly proportioned to the body surface. In the above calculations the weight of ten tadpoles is treated in the calculations as though it were the weight of a single animal. It is evident that when the sum of the body weights of any two animals equals that of a third animal, their body surface is much larger and according to Richet's law exhale more  $CO_2$  than a single animal of equal weight. To illustrate: Take the weight of the ten tadpoles of experiment and regard it as the weight of one animal, the body surface would be 226.24 sq. cm., but regarded as the weight of ten animals of the same species the body surface equals 470.4 sq. cm., or twice the area of a single animal of that weight. It is evident that a plus correction for body weight might properly be made and thus lower the amount of  $CO_2$  exhaled per kilo. of animal.

portion,"<sup>1</sup> and that found in the latter the "gravimetric portion." The sum of the two being the whole amount exhaled. A detailed statement of the experiment and results are given in Table I. This Table shows that a maximum amount of  $\text{CO}_2$  is produced at the optimum,  $20^\circ\text{C}$ , and that the amounts decrease for temperatures above and below the optimum and further that the fall is much more rapid toward the lower temperatures than toward the higher ones. [See Curve in Chart II.] If then we regard the production of  $\text{CO}_2$  as a fair index of the amount of normal metabolism in an organism we are justified in the conclusion that for this species of embryos, maximum metabolism is coincident and very probably a function of optimum temperature. Page's<sup>2</sup> experiments on the dog show that a minimum amount of  $\text{CO}_2$  is produced in a temperature of  $25^\circ\text{C}$  and that the amount increases above and below  $25^\circ\text{C}$ , which is probably about the optimum for this mammal. [See Curve in Chart II.] Thus the warm<sup>3</sup> blooded animal presents reverse conditions.<sup>4</sup> The fact emphasized here, however, is

tubes and a large Wauflf flask. The first and seventh tube contained concentrated sulphuric acid and pumice stone, the first caught any organic matter issuing from the jar containing the tadpoles, the seventh caught organic and moist particles coming from the Wauflf flask at times of a negative pressure, the remaining five tubes contained potassium hydrate slightly moistened. The difference in the weight of these tubes thoroughly dried and corked, before and after the aspiration is the weight (with one correction) of the  $\text{CO}_2$  that escaped from the water.

The estimation of the amount of  $\text{CO}_2$  that remained behind in the water was made by the quantitative method devised by Pettenkorfer, (For description see Fresenius, Quant. Anal., Amer. Ed., p. 834.)

<sup>1</sup>The water to be tested was siphoned from the jar into a 100cc burette and from thence into a bottle corked with ground glass. The  $\text{CO}_2$  of the air in the room and of the water used was deducted from the sum of the "volumetric" and "gravimetric" portions. The air aspirated was corrected for temperature and pressure. The  $\text{CO}_2$  in the room was determined by both the Lunge and Regnault methods. The  $\text{CO}_2$  of the tap water was determined by the Pettenkorfer method.

<sup>2</sup>Page: External temperature affecting the amount of  $\text{CO}_2$ , Jour. of Phys., Vol. II, p. 228, 1879-80.

<sup>3</sup>Body temperature of warm blooded animals is kept constant by all parts of the body being constantly oxidized, so that when the external temperature is low much burning is needed to maintain the requisite temperature, and consequently much carbon produced; also if the external temperature is above that of the body it hastens oxidation. That the relative amounts of  $\text{CO}_2$  produced at any temperature below the optimum for cold blooded animals should bear a direct proportion to that temperature is evident, but why the amount should decrease above the optimum is not so clear. It is suggested that probably the higher temperatures destroy or disorganize the normal physico-chemic life processes, since the heat rigor of tadpoles is reached at  $34^\circ - 35^\circ\text{C}$ .

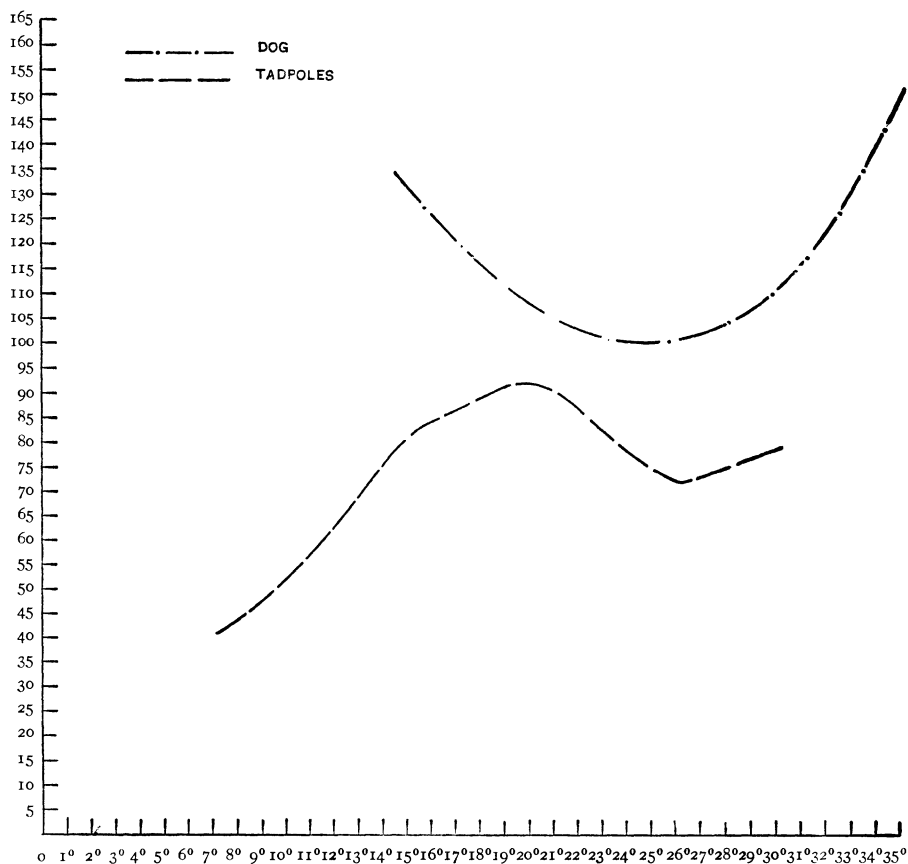
<sup>4</sup>Edward Smith shows that the quantity of  $\text{CO}_2$  given off in man is inverse as the change of the temperature; the vital changes lessening with increase of temperature. Food, p. 11.

that there is a comparatively *fixed* rate of metabolism in optimum temperature for both species.

The next question of importance is, what effect has maximum

CHART II.

*Curves showing the relation of the production of  $CO_2$  at different temperatures for dog and tadpole.*



metabolism on the tadpole, as a whole? To secure experimental evidence on this point a group of ten tadpoles was subjected to their optimum for two months. A second group of

10 were kept in a temperature<sup>1</sup> varying from 6°–8°c below their optimum the first month and 4°–7°c below the second. The results are given in table II, which show that the tadpoles enjoying their optimum increase more rapidly in both weight and length.<sup>2</sup>

It appears then that optimum temperature, maximum metabolism and most rapid growth are causally related; another

TABLE II.

*Showing the rate of growth of ten tadpoles in their optimum temperature, and of ten others in 4°c.–8°c. below the optimum.*

Date.	In Optimum.				Below Optimum.				Difference of Increase.	
	Wt.	Gain.	Length.	Gain.	Weight.	Gain.	Length.	Gain.	Wt.	Length
Nov. 28, 1896.	39 Grs.	—	7.11 cm.	—	38.5 Grs.	—	6.81 cm.	—	—	—
Dec. 26, 1896.	45 " "	6 Grs.	7.57 "	.46 cm.	43 "	4.5 G.	7.16 "	.35 cm.	1.5 Grs.	.11 cm.
Jan. 26, 1897.	50.2 "	5.2 "	7.88 "	.31 cm.	47 "	4 "	7.41 "	.25 "	12 "	.06 "

inference is, that the optimum is chosen because that particular temperature is a factor in the organism's well-being, that it affords just that temperature stimulus necessary to set agoing the physico-chemical activities in harmony with that pitch or rhythm which natural selection has determined for that species. The same interpretation, in the absence of conflicting evidence, may be extended to all thermotactic organisms, *i. e.*, a positive thermotactic response is an effort of the organism, guided by the "differences in the intensity of heat to which the two poles

<sup>1</sup> Two glass jars of same shape and size were used. They contained equal quantities of tap water into which was put same kind and as near as possible equal amounts of grasses and foods. The jar, in which it was desired to keep a known and constant temperature, was placed in a copper kettle containing on an average nine liters of water. The bottom of the glass jar barely touched the surface of the water. In this way the temperature of the water in the jar was maintained between 20°c–23°c. The temperature of the second jar varied with that of the room, which during the months through which the experiment extended fluctuated between 12°–18°c. The experiment was extended through the months of February and March, but serious and frequent mishaps set in that rendered the results worthless. Although the experiment ran smoothly during the months reported, the force of the results is weakened by the short period of the experiment.

<sup>2</sup> Drs. Davenport and Castle report tadpoles as growing more rapidly under constant temperature of 24°–25°, then those subjected to 15oc. The results of my experiment had been described some time before their work came into my hands.

of the body are subjected," to seek a temperature, in agreement with its physico-chemical constitution.<sup>1</sup>

Malling-Hansen's<sup>2</sup> discoveries of the intimate relation between temperature and growth of man are quite pertinent to our present problem. He demonstrates a rhythmic response of growth in both weight and height to the large and small portions of the sun's corona as they are successively presented to us by the sun's  $27\frac{1}{3}$  days' rotation. The greatest height of the growth curve is coincident with the time in which the larger sector is presented, as this recedes, thus lessening the output of solar heat toward us, the curve falls, but rises again, though not so high, when the small sector of the corona is turned on us. That is, there are two waves of the growth curve comprehended within about  $27\frac{1}{3}$  day period, which waves are coincident with the earthward appearance of the large and small sectors of the corona. This is interpreted as a delicate cosmical adjustment of life to temperature.

Enough has been said of only one of the cosmic factors to illustrate its delicate adjustment with life. But it is difficult to see, even though we were to consider every possible cosmic factor from the same point of view, how they have been effective in either bodily or psychic differentiation until we consider some of the inherent properties of protoplasm itself.

How does it conduct itself along the narrow path marked out by cosmic forces? The laboratory attempts to answer the question, in part, by experimentation which aims to test the capacity of protoplasm for acclimatization.<sup>3</sup> These experiments include acclimatization to<sup>4</sup> chemical agents,<sup>5</sup> to<sup>6</sup> desiccation,<sup>8</sup> temperature,<sup>7</sup> changes<sup>9</sup> in food, etc. The general verdict is that protoplasm is *automatic adjustable*, that it *husbands*, and *profits* by its *experience* within its *milieu*. It appears that the teachableness and the ability to profit by it are among the chief distinguishing features of protoplasm. In fact the history of morphology, of adaptation, of evolution itself is writ

<sup>1</sup> "It (protoplasm) is highly sensitive to changes in temperature . . . . . migrating if possible so as to keep in the temperature to which it is already attuned." Davenport, *Experimental Morphology*, p. 263.

<sup>2</sup> Malling-Hansen: *Perioden im Gewicht der Kinder und in der Sannwärme*, Copenhagen, 1896.

<sup>3</sup> Davenport, C. B.: *loc. cit.*, pp. 27-32; 65; 85-88; and 249-58.

<sup>4</sup> Sewall, Henry: *Experiments on the Preventive Inoculation of Rattlesnake*, Jour. of Physiol., Vol. VIII, pp. 203-210, 1887.

<sup>5</sup> Loew, O.: *Ueber den Verschiedenen Resesturf grail im Protoplasm Arch. f. d. ges. Physiol.*, Vol. XXXV, pp. 509-516, 1885.

<sup>6</sup> Lance, M. Denis: *Sur la reviviscence des Jardigre des comp. Rend.*, Vol. CXVIII, pp. 817-818, 1894.

<sup>7</sup> Mendelssohn: *loc. cit.*

<sup>8</sup> Semper: *Animal Life*, p. 133.

<sup>9</sup> Davenport, C. B.: *loc. cit.*, pp. 253-254.

large with the effort of life to secure the completest adjustment possible both on the bodily and psychic sides.

The delicate adjustment between life and cosmic forces, the continual effort of life to maintain this adjustment, on the one hand, and the rhythmical, periodical manifestation of the migrating instinct *par excellence* on the other, suggest the importance of considering the mode or nature of the interaction between life and external forces.

According to Fiske<sup>1</sup> and Spencer<sup>2</sup> all cosmic forces obey a rhythmical motion which is a corollary from the persistence of force.

We may reasonably assume that the primitive *megazoön* found itself in this maze of cosmical rhythms. Heat, light, sound, wind, electricity, etc., beat upon these primordial creatures in rhythmic waves. We may imagine that one of the first tasks of this life was to get in rapport with these innumerable cosmic movements.

In fact existence, survival itself, and the evolution of the organism were conditioned largely on a rhythmical adjustment to the inorganic forces of creation. "Those<sup>3</sup> spontaneous compounds whose internal rhythms chance to accord with the external rhythm enjoy the greater probability of survival and thus rhythmic interaction between the internal and the external may be developed through the exclusion of the non-rhythmic, elimination of the ill-rhythmic and the preservation of the duly rhythmic." What is this adjustment but a continual effort of life functions to operate in unison with cosmic rhythms. Accordingly we find rhythms prevailing through all life processes both physiological and psychical.

The elaboration and assimilation of food into the body tissue in excess of waste and repair is rhythmical, that is to say,<sup>4</sup> growth obeys this law. The<sup>5</sup> menstrual life is associated with a well-marked wave of vital energy which manifests itself in the temperature of the body, in the pulse rate, etc., etc. These several phenomena have a striking coincidence to both the lunar period and sun's rotation. The<sup>6</sup> pulse shows an annual rhythm maximum in winter and minimum in summer. The daily bodily<sup>7</sup> temperature is higher in the evening than that of the morning. The return of zymotic diseases in some countries show a remarkable regularity and appear to stand in

<sup>1</sup> Fiske, John: Outline of Cosmic Philosophy, Vol. I, pp. 297-313.

<sup>2</sup> Spencer, H.: First Principles, pp. 256-257.

<sup>3</sup> McGee, W. J.: Earth the Home of Man, p. 5.

<sup>4</sup> Malling—Hansen: *loc. cit.*

<sup>5</sup> Stephenson, Wm.: Am. Jour. Obstet., Vol. XV, 1882, pp. 283-294.

<sup>6</sup> Coste F. H. Perry: Nature, Vol. XLIV, 1881, p. 35.

<sup>7</sup> Bucknill and Tuke: Psychological Medicine, 4th Ed., p. 317.



causal connection with certain climatic elements. In India,<sup>1</sup> for example, the fluctuations of the death rate by fever coincide with the variations in the range of temperature.

That these innumerable cosmical and physiological rhythms have greatly influenced the soul and have stamped upon it highly colored rhythmical activities are evidenced in every period and condition of human history, in every field of human thought and feeling.<sup>2</sup> It is manifested among primitive peoples by the readiness and completeness with which they surrender themselves to music and dancing, by their strict observance of annual festivals and celebrations.

The early mind was impressed by this universal principle. Their gods and demons did things rhythmically. They visited the earth, made war and peace, and discharged their herculean tasks for the most part with strict periodicity.<sup>3</sup>

Spencer has pointed out that philosophic thought obeys this principle. Now Platonic idealism is all-pervading, now the materialism of a Hobbes, then the ebb of Hegelian idealism gives way to the flow of materialism of the third quarter of this century.

Further, our volitional nature pulsates rhythmically. Marriages<sup>4</sup> in every country show a more or less periodicity. The time of the year for marrying in different countries is somewhat influenced by custom, religious beliefs, harvest<sup>5</sup> time and the *return of spring*.

<sup>6</sup>Leffingwell raises the question concerning the influence of spring upon the ratio of legitimate to illegitimate births. "Among human beings is there yet remaining any trace of that instinct which leads birds to mate when winter goes, and which in earlier periods of man's development was perhaps as strong as with other animals?" "If it exists should we find any difference in and out of the marriage relation?" The birth rate of <sup>7</sup>France, Norway, Sweden, Holland and Italy

<sup>1</sup> Hill, A. S. : Nature, Vol. XXXVIII, 1888, p. 245.

<sup>2</sup>The psychological aspect of the subject is treated indirectly in every modern exposition of sound, retinal revelry, fatigue and attention. Bolton has treated the subject directly and especially as it is manifested in music, verse and poetry. *Am. Jour. Psy.*, Vol. VI, pp. 145-238.

<sup>3</sup>Kelly, W. K. : Indo-European Traditions and Folk-Lore.

<sup>4</sup>Farr, Dr. William : Vital Statistics, p. 76, London, 1885.

<sup>5</sup>Hill, A. S. : Nature, Vol. XXXVIII, p. 245, 1888.

<sup>6</sup>Leffingwell : Influence of Seasons upon Conduct, p. 115.

<sup>7</sup>Observations tend to show that the largest number of conceptions in Sweden fall in June; in Holland and France, in May-June; in Spain, Austria and Italy, in May; in Greece, in April. That is, the farther south the earlier the spring and the earlier the conceptions—Mayo-Smith, Statistics and Sociology, 1895. In Massachusetts the largest number of marriages is shifting from late fall and the New Year, which prevailed down to 1870, to April and June—Mass. State Board of Health, 1896, p. 731.

show that the ratio of illegitimate births between the spring—summer months and the fall—winter months is greater than the ratio of the legitimate births covering the same period. The ratio of the totals for the countries just named for legitimate births between spring—summer months and fall—winter months is 24 : 23 and for illegitimate births for the same periods the ratio is 26 : 22—pointing to a permanent seasonal influence on the reproductive functions and to the genial effect of spring upon the procreative functions. More striking, however, is the evidence of periodicity in the tendency to those relationships which occasion illegitimate births. Under like conditions the excess of the seasonal ratio of illegitimate births over that of the legitimate is a direct expression of the remnant of that passion implanted in man when pairing in spring time was almost universal. The strength of the reverberation of this passion is inversely to the respect for the prevailing customs, religion and law.

The relation between spring and certain bodily and mental conditions finds emphasis in a large group of phenomena arising from *spring fever* and *ennui*. The following are typical cases of one hundred and twenty received on that subject. (See Syllabus, Rubric XII.)

1. M., 20. Whenever I am afflicted with what I have always called spring fever I feel sleepy and tired and have no ambition to study.

2. F., 19. Feel sleepy, languid, no ambition; strength seems to have left me, and every duty seems a great trouble.

3. F., 17. I have no power of concentration, feel that I must be out of doors all the time, am drowsy and ache all over. Like to sleep—can eat only certain things.

4. M., 25. Was physically weak, or rather inert, so that I could hardly drag one foot after the other and the queerest longings beset me—now for a gust of wind to fan my face, now for an apple (would have given almost anything for an apple once), and then I wished intensely for a swift ride. This fever of queer, delicious lassitude and longing lasted nearly three weeks and during that time I was of practically no use on the farm.

5. F., 16. Felt as though all energy had fled, and that I was such a weak mortal—not fit for this life which needs so much energy and brightness.

6. F., 18. Wanted to sleep, or meditate, or dream the time away. It seemed too much trouble to think, to speak or to act. Some very romantic or thrilling story interested me somewhat, but I soon wearied of it.

7. F., 19. I wanted to lounge around in the open air—never want any one to bother me.

8. F., 17. I feel tired of everything, and that I cannot drag out another day—things are weary, stale, flat and unprofitable.

9. F., 18. Could I only break away and go somewhere by myself where the sun is bright and warm and where I can hear birds singing, find a nice comfortable position and spend my time in day-dreaming, I should be perfectly happy.

10. F., 17. Felt as though there was absolutely no life in me and

that I should go wild if I did not get away from everybody and be alone in the wood or on the water in a quiet bay.

11. F., 22. Lose interest in my work, study is a burden. The feeling is impossible to describe. It is a longing for something, I know not what. Often I have sat quietly and tried to analyze it but cannot.

12. F., 19. I feel dull, drowsy, can't hurry, prefer to drag along as I please. Sometimes I like to walk slowly along some shady path or sit down under a shady tree and dream my life away. I have had a desire to be married and have a home of my own. I think I have planned where it shall be and how furnished, a dozen times. Perhaps it is very foolish; but I do it very often.

13. M., 30. This spring a strong wave of sentiment came over me to see an old chum and sweetheart. I could hardly restrain myself from setting out instantly to see her which would have been a long journey.

14. F., 20. Spring fever affects me most about June or when school closes. Then I have a great longing to skip two years. This longing is connected with love. I expect to have a house of my own at that time, and O! how anxious I am to see that time. It is hard for me to work patiently. I like my studies because they take my mind away from thinking too much about this much desired thing.

15. M., 26. I feel most these impulses as often as once a month, at least. And when school is over the tendency is irresistible. I always rush off somewhere. I feel every year as though so much of student life was becoming unendurable. I must get out and do something. I often feel so in regard to love. It is the Lord of promise. I feel oftentimes as if I had waited long enough, and I must fall in love with and marry somebody.

16. M., —. Physician says: "In my youth I had frequent attacks of ennui, and sometimes desired to break away from home and see the great world, but since blessed by a good wife and daughter and a pleasant home, together with more philosophic views of life which came with age, such feelings have gradually faded away."

Longing in the distance, desire for wider liberties and space, hunger, are often strongest at this period. (100 cases of this group.)

17. F., 38. From the age of 20 to 30 I felt spring fever strongly, longed to see strange sights in other countries, felt myself hemmed in and stifled.

18. F., 19. I have often felt during the spring months as if I would like to find employment among strangers—never desired to go any great distance away from home.

19. M., 22. I longed to be out of doors, and to sit under the trees alone and meditate.

20. F., 19. The feeling of longing in the distance comes over me at this time. I try to think what it is, but I cannot. There seems to be something. I have often thought how I would like to have a family, how I would enjoy taking care of the children.

These cases interest us only so far as they contribute evidence to the proposition that there are still left remnants of instinct feelings interwoven and combined with the reproductive functions that stand in causal relation with the cosmic forces of spring time. To summarize the general and salient characteristics: the majority report a tired, languid, worn-out

feeling; a feeling of lassitude; a restless, trembly nervous feeling; a dull, drowsy, hesitating condition. Many complain of headache, no life or energy left, felt as though the blood had ceased to circulate. The air of the room feels poisonous, stifling and suffocating. They long for fresh air, to get out under the wide sky, to lounge and sleep, to lie on the grass and have bugs and beetles crawl over them, to be let alone, to sit down quietly and read, to sit under a shady tree and be read to, to dream, to meditate, to walk slowly in shady paths, to sit quietly in a boat in some secluded bay. Some become quite anti-social and want to be let alone. They wish to forget work and duty. It is hard to think, to concentrate, to direct the attention. Work is distasteful and unsatisfactory. They lose interest and ambition in the work of the moment, and desire a change.

Others wish to begin life anew, to enter upon some great and uplifting work, to be a good samaritan, to be independent, to make a success of things, to cross swords with the world. Many state that they experience passions of love, desire to be married, day-dream over their future home, how it shall be built, how furnished, and how they will delight to care for the children.

These passions, dreams and fancies do not always pass away as such, but according to statistics already quoted express themselves by increasing the number of marriages and conceptions during the vernal season. Could it be that lassitude, restlessness, the inability to think, to concentrate the attention, so frequently mentioned, are due to the shifting of the main bulk of the metabolic processes from the vegetative to the reproductive functions. The fact that thought processes—especially attention—are associated with increase blood supply to the brain, lends color to the view, that when thought is difficult—in the absence of fatigue and other ordinary causes—an increased blood supply is attracted to the reproductive organs.

A very interesting and instructive correlation exists between the age of the individual and the season of the year in which running away from home occurs. (See Chart III.) From one to eight by far the majority leave during the summer. At four, spring takes the lead of autumn and winter, and continues to increase until the seventeenth. The summer curve begins at eight, to fall gradually until at ten, where it follows closely the autumn and winter curves to the sixteenth year, joining the spring curve at seventeen. The feeble and even height throughout all ages is noteworthy in the winter curve. The same description applies to the autumn curve, save that it is higher at the majority of ages, especially at nine and ten,

where it even rises above the summer curve. These two curves regarded separately contain but little interest, merely showing that all ages behave about alike at these seasons; but when compared with spring and summer they indicate that man, like the rest of organic life, hovers about his hibernating quarters. The spring curve, though interesting even alone, derives additional import by comparison with those of the other seasons. From one to seven the number leaving in spring are about equal to those of autumn and winter. At eight the curve makes a considerable rise, leaving the winter and autumn curves far below. Doubtless the phenomenal rise at this age is associated with the child's love of nature and the varied outdoor activities paramount at this period of childhood. The spring runaway is a reaction against the prison life of winter, together with a strong tendency to revel in the out-door charms of spring. Chart IV shows that the nature curve attains its greatest height from eight to eleven, inclusive. A second and larger rise occurs in the fourteenth year, which continues through three successive years, falling slightly in the fifteenth year.

Now from one to twelve years or thereabouts, the child is neuter respecting much that belongs to both primary and secondary sexual differentiation. Up to this time he is a vegetative animal, his activities being determined by atavistic tendencies and by forces that affect the vegetative functions. At about the thirteenth year, however, the physiological<sup>1</sup> changes and peculiar psychosis that take place as a result of the functional development of the reproductive organs expose the organism to a new play of forces that eventually topple the unsettled physiological and psychical elements over into a field of periodic activities recognized as sexual, or as irradiations of these functions.

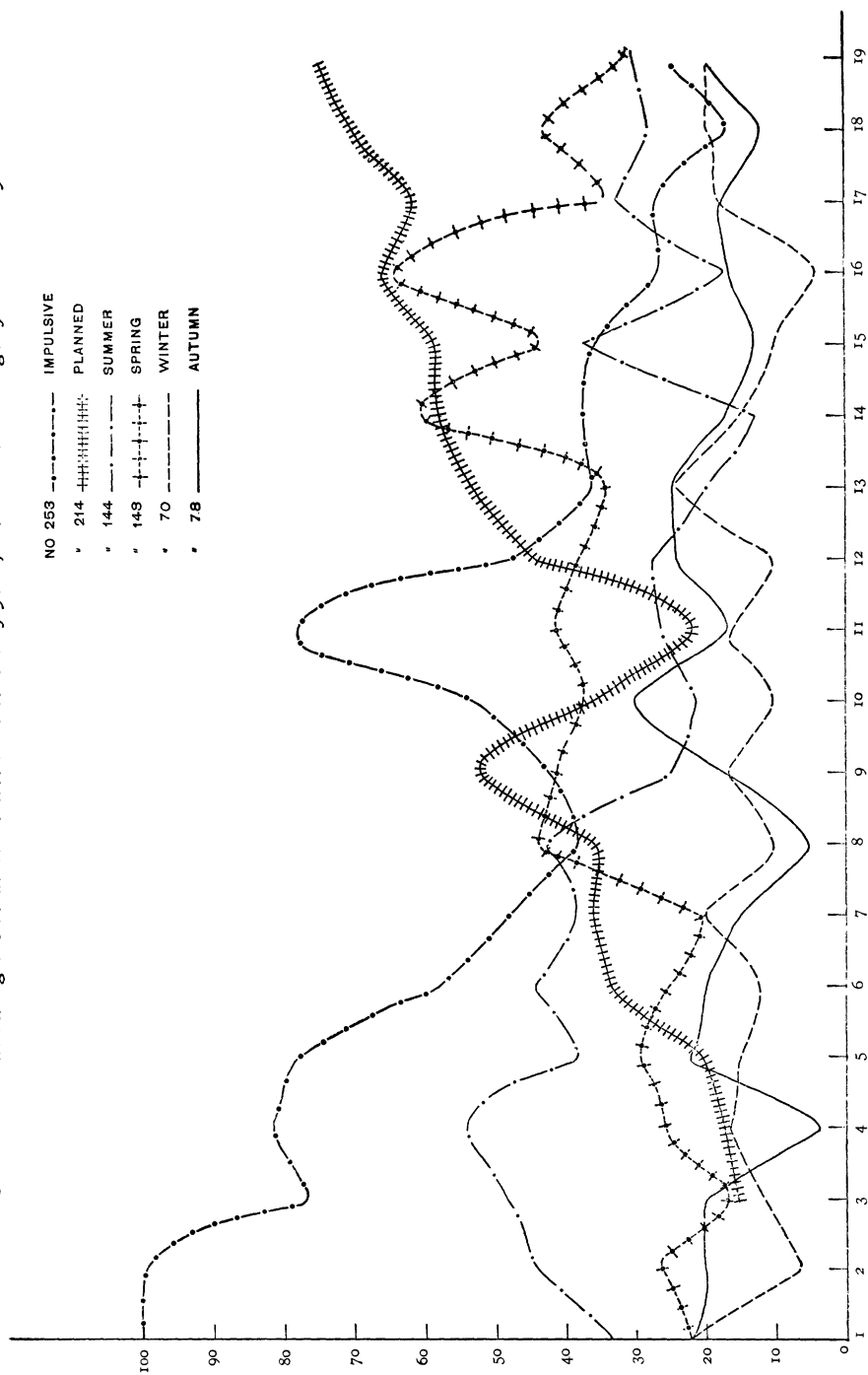
Considering the data as a whole, that furnished by marriages, spring fever psychosis, and that of the runaways, we are justified in the inference that both youth and manhood up to thirty odd years, are more susceptible to the feelings of sex and its irradiations at that season of the year when the "will to live" is making a universal effort.

Thus far I have tried to develop three general notions: (1) the delicate and vital relation that exists between life and cosmic forces; (2) that the first and most fundamental effort of

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<sup>1</sup> For literature on these changes see Ranke: *Grundzüge der Physiologie*, 1881. *Das Volum des Herzens und die Weite der grossen Arterien-Pubertätsentwicklung des Herzens* S 490-94; Lancaster: *Ped. Sem.*, Vol. V, No. 1. The Psychology and Pedagogy of Adolescence. Donaldson: *Growth of the Brain*, also Clouston: *Neuroses of Development*.

CHART III. Showing the relation between the season of year, the manner and age of the runaway.



life is to keep in rapport, in attune with cosmic and, I should add, social forces ; (3) that as a result of the first two conditions life processes, both psychical and physical, have become rhythmical ; and that the higher the organism the more complex the rhythmical adjustment, *e. g.*, the savage must keep in unison with his tribe. He must hunt, dance, fight and celebrate victories with his fellows. The life of the modern man is a web of rhythms ; he must not only respond with the rest of creation to cosmic rhythms, but also to the manifold periodicities of civilized life. He must keep in unison with the movements of his trade, with the pulsations of his profession and his society. He must keep step with the fads and whims of his club or drop out.

The thesis maintained here is, that migration is *one* method adopted by an organism to maintain its psycho-physiological activities in attune or rhythm with those of the organic and inorganic world.

It has become a universal mode by which organisms restore and maintain the factors essential to their well-being, be it for light, heat, pressure, food, relation to society, position in trades, profession or what not. It is the mode employed by nomadic<sup>1</sup> societies<sup>2</sup> to make good the exhaustion and failure of the food supply, by the peasant who comes to America, thereby relieving the pressure of oriental social conditions. The pilgrimages to Rome, Jerusalem and Mecca, are efforts to maintain a more complete adjustment to certain complex religiousociological customs and rites.

The children's Crusade<sup>3</sup> at the beginning of the 13th century is perhaps an illustration of the greatest attempt of a body of human beings to regain peace and well-being to the body and soul by migrating.<sup>4</sup> Coxey and his army, as others have done elsewhere, embraced the principle to relieve their social and economic strains and stresses. The planomaniac breaks the monotony of the home by daily gadding the street.

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<sup>1</sup> Spencer, Herbert : Synthenic Philosophy, Chapter on Rhythm.

<sup>2</sup> McGee, W. J. : Amer. Anthro., Vol. VIII, No. 4, 1895.

<sup>3</sup> The history of that period records that war and turmoil were everywhere supreme. Desolation and poverty covered vast districts ; starvation entered many homes. Society was disorganized, law and religion a mockery. No time for reading or study,—the densest ignorance settled over the land. In the midst of all this St. Bernard came preaching the failure of the preceding crusades, due to the sinfulness and wanton folly of the pilgrims and soldiers. The Holy Sepulchre must be reclaimed by innocent hands. Who were such ? The children of the land : accordingly 20,000 German boys and girls, 10 to 16 years of age, and 30,000 from France at once took up the cause which so soon ended in every form of misery.

<sup>4</sup> Gray, Geo. Z. : The Children's Crusade or an Episode of the 13th Century.

The well-to-do-citizen, and globe-trotter yielding to the popular fashion joins the annual summer wave of European tourists. The American student to hold his place at the crest of his profession feels it necessary to join the semi-pilgrimage to European universities.

## SECTION A.

## MIGRATION OF ANIMALS.

*Wild Animals.*

This section embodies in a brief form the observations and theories of naturalists on migrations among lower animals.

CRUSTACEANS. "The adult lobster<sup>1</sup> never moves up and down the coast like the migratory fishes, but is of a far more sedentary disposition." In the spring months of April and May, however, large numbers appear to move from deep water toward the shore. In the fall they retire to deeper water again. This is proven from the fact that they are caught in from three to ten fathoms of water from May until November; for the rest of the year fishing is conducted in thirty-five to forty fathoms. If the spring is late and the water cold the lobster keeps away from the shore. The land crabs of the West Indies<sup>2</sup> are generally found in great numbers in holes and cavities among the mountains; but every spring they descend in immense bodies to the coast, . . . pursuing so direct a line to the place of their destination that scarcely anything will divert their course. <sup>3</sup> "When they have effected the purpose for which they undertook their journey, they slowly return, weak and exhausted; and not long after, millions of the little crabs, which have been hatched on the shore may be seen making their way up to the mountains."

INSECTS. The predatory onslaught of the locusts has been witnessed over all temperate and tropical regions and has quite a place in history. We read in Exodus: "And the locusts went up over all the land of Egypt and rested on all the coasts of Egypt: very grievous were they. . . . For they covered the face of the whole earth, so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees . . . and there remained not any green thing in the trees, or in the herbs of the field, through all the land of Egypt." Similar descriptions are found in Pliny, Cauch,<sup>4</sup> Figuiet,<sup>5</sup> Swainson,<sup>6</sup> Wallace<sup>7</sup> and others of this ruth-

<sup>1</sup> Herrick: The American Lobster, p. 20, Washington, D. C., 1895.

<sup>2</sup> Heilprin: Distribution of Animals, p. 41.

<sup>3</sup> Swainson: Habit and Instinct, p. 263.

<sup>4</sup> Cauch: Illustrations of Instinct, p. 151.

<sup>5</sup> Figuiet: The Insect World, p. 302.

<sup>6</sup> Swainson: *loc. cit.*

<sup>7</sup> Wallace, A. R.: Geographical Distribution of Animals, Vol. I, p. 32, 1876.



less reaper of all kinds of foliage whatever. Such expressions as the following are used in attempting to express their numbers : "Such was its density that when they flew low one person could not see another at the distance of twenty paces." "It totally intercepted the solar light." "Like a shower of snow, when the flakes are carried obliquely by the wind." Mr. Barrow describes a migration of locusts of Southern Africa in 1797. They literally covered an area of nearly 2,000 square miles. When driven into the sea by a northwest wind they formed upon the shore for fifty miles, a bank three or four feet high ; and when the wind was southeast, the stench was so powerful as to be smelt at the distance of 15 miles. Their movements are always with the wind, sometimes preceding a strong wind. The same is true of the well known dragon-fly "storms" of South America. Their migrations, like many other insects, never occur at stated times and seasons as those of higher animals, but depend on various *concurrent* causes ; as the humidity of the preceding season, the intensity and direction of the wind, barometric pressure and food supply. <sup>1</sup>Hudson says : "The cause of the flight is probably dynamical, affecting the insects with a sudden panic and compelling them to rush away before the approaching tempest. The mystery is that they should fly from the wind before it reaches them, and yet travel in the same direction with it." I venture to suggest that their sudden appearance from five to fifteen minutes before the wind storm is due to the well known barometric <sup>2</sup>rise preceding wind and thunder storms.

<sup>3</sup>On the other hand the migrations of several species of butterflies and the nuptial flights of ants obey seasonal and climatic influences. Butterflies (notably the painted lady) fly in huge numbers in France, England, Italy, Switzerland and

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<sup>1</sup> Hudson, W. H. : The Naturalist in La Plata, pp. 130-134.

<sup>2</sup> Davis, W. M. : Elementary Meteorology, 1894, p. 250.

<sup>3</sup> Cauch cites several instances of sultry, moist, warm weather interrupted occasionally with showers and thunder storms which were also periods of wave movements of the dragon-fly. "As to the great multiplication of these insects about the end of May in the present year, it is by no means mysterious. From the beginning of that month to the 21st, the weather had been exceedingly rainy ; rivers and lakes overflowed and spread their inundations over immense areas of low grounds, whereby myriads of the pupae of the *Libellulae*, which under other circumstances, would have remained in deep water and become the prey of their many enemies, were brought into shallow water ; and the hot weather from May 21st to May 29th converted those shallows into true hot beds. Numerous thunderstorms (at Weimer there were four) during that week must have greatly encouraged their rapid development into perfect insects ; and so those clouds of winged insects rose almost at once from the temporary swamps and were *immediately obliged to migrate in order to satisfy their appetite as these species are very voracious.*"

Brazil. In the European countries their flight is from south to north during the spring and summer months. In Brazil their movements are from north to south, or from northwest to southeast. They are usually from the dry arid districts of the interior toward the verdant forests of the sea coast during May—June. "We could mention many facts tending to favor the opinion that all these butterfly migrations are made toward these verdant tracts, for the purpose of breeding or rather of depositing their eggs." Huber has associated special climatic conditions with the nuptial flights of insects. "Let<sup>1</sup> us retire to a meadow on a fine summer's day at a time when they first make use of their wings." "Ants<sup>2</sup> are now and then induced to change their residence. Should it be too much in the shade, too humid, too exposed to the attacks of passengers, or too contiguous to an enemy's quarters . . . they leave it to lay the foundations of another. This I have denominated migration." "During these flights impregnation occurs, and their wings are shed after alighting."

FISH. Their migrations are variously classified: in time; they are either regular, *i. e.*, seasonal, or irregular, many species of the anadromous fishes furnish examples of seasonal migration, long and irregular absences of the bluefish and chub mackerel from our shores represent the latter: In direction, it may be said that they migrate roughly in three planes: (1) a horizontal plane extending toward or from the equator—such movements are largely controlled by temperative conditions; (2) a plane at right angles to the first, to or from the shores, caused by the fish seeking a stratum of water of an agreeable temperature, and also by the stimulus of the spawning season. Ichthyologists are now of the opinion that movements in this plane constitute the great majority of their migrations; (3) a vertical plane to which Goode<sup>3</sup> has given the name "bathic migrations." Such movements are controlled by temperature, winds, currents and light. It is generally thought that the causes of these several movements are due to changes in temperature, a desire for suitable places for spawning and to search for food. Winds, currents, light and density of the water are also regarded as minor factors.

The most potent of these factors, however, is temperature. I shall enumerate only a few of the best confirmed observations.

*Temperature.* The optimum temperature for the menhaden is 60°–70° Fahrenheit, that of the herring is 45°–55° Fahrenheit. The former is a warm, the latter a cold-water species.

<sup>1</sup> Huber: *Ants*, p. 96.

<sup>2</sup> Cauch: *loc. cit.*, pp. 148–152.

<sup>3</sup> Goode, G. Brown: U. S. Report, Fish and Fisheries, p. 51, 1877.

Accordingly,<sup>1</sup> when the menhaden desert the Gulf of Maine they are replaced by the herring. Cold weather drives the menhaden to the warm strata (bathic migrations), while it brings the herring to the surface. The relation between the distribution of herring and the degree of heat in the water has an important bearing upon the herring fisheries; "since,<sup>2</sup> when the heat of the surface water is above 55°F. herring are seldom seen; as this decreases they make their appearance. This is so well established that now the herring fishery on the coast of Scotland is largely regulated by the temperature observed, and when it is decidedly above 55° the herring are not looked for." The<sup>3</sup> extent of the catch of anchovies along the shores of Scotland during the fishing season is (at least largely) dependent on the temperature of the water during the mid-summer months of the preceding year.

*Search for Food.* Baird observes that oceanic currents have a more or less influence upon the distribution of fishes. This, however, depends more upon their pursuit of the less independent algæ, jelly-fish, crustaceans, ascidians, etc., that float hither and thither with the currents. Prof. Möbius (quoted by Beard), in investigating the food of the herring in the German seas finds that the abundance of herring in any one season is in strict proportion to that of the shrimp. A direct and combined effect of food and temperature upon fish movements is found in San Francisco Bay. This bay receives the waters of two very large rivers, which bring down constantly a large amount of minute animal and vegetable life, much of which finds a congenial home in the bay, thus furnishing a large and varied quantity of food for its fish life. The temperature of the bay is almost constant, varying only a few degrees at any season of the year. The constancy of these two most important factors (food and temperature) throughout the year ought to reduce migrations to a minimum. Observations confirm this supposition.<sup>4</sup> The official report reads: "That the conditions are extremely favorable to the support of aquatic life is demonstrated in the rapid increase and *permanent residence* (italics mine) of the several fine food-fishes introduced from the Atlantic coast by the government. Some of the fishes thus acclimatized are naturally anadromous, but in San Francisco Bay, contrary to their usual migratory habits, they do not appear to have any desire to spend much, if any, of their ex-

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<sup>1</sup> Goode, G. Brown: U. S. Fish Com. Report, p. 72, 1877.

<sup>2</sup> Baird, Spencer F.: U. S. Fish Com. Report, p. 55, 1886.

<sup>3</sup> Bottemanne, C. J.: p. 340, Vol. I, Jour. Marine Biolog. Ass'n.

<sup>4</sup> Wilcox, W. A.: Fisheries of the Pacific Coast, U. S. Fish Com. Report, 1893.

istence in the ocean." Another<sup>1</sup> example of the sufficiency of food and limited range of temperature checking the wandering of fish is furnished by the menhaden that may be found at all seasons of the year along the coasts of Ga. and S. C. Only a partial migration occurs in mid-winter, which is now believed to extend only a short distance seaward.

*Wind, Light, etc.* Herr von Freedon (quoted by Goode) finds that warm winds and clear skies of the North German seas are coincident with large catches, and *vice versa*.<sup>2</sup> "A bright sunny day," says Baird, "will frequently call up forms that are never seen at any other time, while others, again, only approach the surface on cloudy days, or even in the night, exclusively." Experts testify that along the shores of Scotland thunder storms of some magnitude and extent affect seriously the quantity of the catch on the following day. If any are caught, it is at extreme depths.

*Movements Affected by Enemies.* Salmon are known to entirely abandon a particular section of sea coast by the onslaughts of the white whales and porpoises. In<sup>3</sup> the fall of '94, owing to the vast numbers of bluefish and squeteague (deadly enemies of the menhaden) in the vicinity of Montauk Point, large schools of menhaden were detained in Gardiner and Neapeague bays weeks beyond their usual time of departure, and were unable to reach the ocean until their enemies had left. About October 21st the bluefish disappeared, and the departure of the menhaden rapidly ensued. In fact, so great is the fear of the menhaden for the bluefish—a veritable corsair—that the former are known to reverse the course of their annual migrations for several weeks should the latter appear in their front.

*Reproductive Instinct.* The movements associated with the reproductive period give the clearest evidence of a migrating instinct. Moving from an uncomfortable to a comfortable temperature, seeking light of proper intensity, pursuing and capturing prey are activities of the more simple, reflex type—a reaction to a simple stimulus. True, migrating movements are in obedience to stimulus, but a stimulus of a very *complex* sort, it is *periodic* and *persistent* leading to the execution of large and definite tasks, impelling<sup>4</sup> the species to a particular spot at a fixed time. They are performances larger than individual ex-

<sup>1</sup> U. S. Fish Com. Report, p. 40, 1877.

<sup>2</sup> Baird, S. F.: *loc. cit.*, p. 57, 1886.

<sup>3</sup> Smith, H. M.: Bulletin of U. S. Com., 1895, p. 299.

<sup>4</sup> The long journeys of catadromous fish give unmistakable evidence of an inherited activity ("primary automatic" by some authors, "congenital" by others). "This species of fish, represented by the eel, are born in the sea, ascend the rivers and reach their maturity in two to four years, and then, when mature, descend to the ocean to spawn, and possibly never leave it again."

perience, and too clear-cut and purposive to be ascribed to immediate sense experience. As sexual maturity approaches the stimulus, which has its origin in the developing reproductive organs, urges it to leave the ocean and, entering the mouth of a river, to journey upward, often thousands of miles, to its source in the mountains. Classical examples of this sort are the seasonal migrations of the<sup>1</sup> salmon,<sup>2</sup> tunny<sup>3</sup> herring,<sup>4</sup> shad and sturgeon up rivers or into quiet estuaries for the purpose of spawning.

BIRDS. The mystery<sup>5</sup> and superstition that has hovered about bird movements are dissolving before sober and careful observation. The problem is by no means solved, but it has been brought from the region of folk-lore<sup>6</sup> and the mere "wonder<sup>7</sup> stage" and given a seat alongside other unsolved problems as anger, hunger, fear, etc. True, the progress for the past twenty years has been so feeble and unsatisfactory that some scientists<sup>8</sup> discourage theoretical speculations on the subject, regarding them not only useless, but a positive injury to real observations of nature. Despite these backward conditions two groups of theories are set forth. To the first group I have applied for the want of a better term *kinetogenetic*, and to the second group *physiogenetic*; meaning by the former such theories as make food, geological, and the several climatological elements the effective causes in originating the instinct, by the second, the periodic physico-chemical processes that are coincident with the reproductive and moulting seasons.

*Kinetogenetic.* Faber (quoted by Homeyer) says: "That nature divided every individual into two irresistible impulses; the wandering impulse (*wanderungstrieb*), and the homesick impulse (*heimwehtrieb*).<sup>9</sup>" The bird shows the former when it leaves the place of its nativity and repairs to a region usually

<sup>1</sup> Romanes: *Animal Intelligence*, p. 294.

<sup>2</sup> "At this time the king of fishes (salmon) is in physical perfection, with few rivals in beauty or strength or fierce energy or indomitable courage and perseverance; but its strength is soon fully taxed in surmounting the obstacles and in fighting the rivals which oppose its progress, until at last, worn and thin, torn and mangled by battle, and battered by rocks? and whirlpools? (question marks mine) with its skin in rags, its fins crippled and bleeding, . . . nothing of its kingly nature remains except the indomitable impulse, which no hardships can quench, still urging it upward, until, if any life is left, it at last reaches the breeding-ground." W. K. Brooks, *Pop. Sci. Month*, Vol. LII, 1898, pp. 784-85. (Prof. Brooks's article appeared after this section had been written.)

<sup>3</sup> Swainson: *loc. cit.*, p. 263.

<sup>4</sup> Wallace, A. R.: *Geographical Distribution of Animals*, p. 19, 1876.

<sup>5</sup> Newton: *Birds*, *Ency. Britannica*.

<sup>6</sup> Wallace, A. R.: *loc. cit.*, p. 21.

<sup>7</sup> Brooks, W. K.: *loc. cit.*, p. 786.

<sup>8</sup> Homeyer, E. F.: *Die Wanderungen Der Vögel*, Leipzig, 1881.

characterized by new foods and climatic elements, the latter by its return after a season to its birthplace.

Darwin's theory is that the ancestors of migratory animals were annually driven by cold or want of food, to travel slowly southwards, . . . and that this compulsory travelling would become an instinctive passion.

Palmèn<sup>1</sup> undertook in 1876 to verify Darwin's theory from the study of geological history. He worked out in detail nine great routes traversed by birds in their passage from Greenland and northern Eurasia to Africa, southern Asia and the East Indies. A glance at the routes shows that the presence of water in the past and present in the form of rivers, lakes, seas and ocean is the major factor in determining the bends in the course of their flight. These routes pertain to bog and water birds. They are quite circuitous, *e. g.*, the most direct route for the crane living on the shores of the Baltic, to its winter home in northern Africa, is across the Alps and along the east shore of Italy. Its actual route is up the Rhine to near its source, and down the Rhone to the sea, and then along the west shore of Italy and Sicily across to Africa. The most direct route for the wagtail from Greenland to a warmer climate is along the eastern coast of North America, instead of this it strikes boldly out to the S. E., across the Atlantic toward the shores of Norway and the British Isles. Ornithologists are agreed that most of our eastern birds come to us through Mexico, and in returning to their winter homes in Central America, they travel through Texas and Mexico, and are unknown in Florida and the West Indies.<sup>2</sup> Others have come to us through Florida, and in returning to their winter quarters do not pass through either Texas or Mexico. This is best illustrated by the bobolink, an eastern bird, which breeding from New Jersey northward to Nova Scotia, has spread westward until it has reached Utah and northern Montana. But, and here is the interesting point, these birds of the far west do not follow their neighbors and migrate southward through the Great Basin into Mexico, but . . . retrace their steps and leave the United States by the roundabout way of Florida, crossing thence to Cuba, Jamaica and Yucatan, and wintering south of the Amazon." While in some cases the relation of the route to the conditions for procuring food is clearly evident, in species like the wagtail, eiderduck and bobolink, no such relation exist at present. This fact brings to the front the permanency of the routes, and fully justifies the inference that not only the impulse to migrate, but also the direction, is an inherited tendency.

<sup>1</sup> Palmèn, J. A.: Die Zugstrassen der Vögel, Leipzig, 1876.

<sup>2</sup> Chapman, F. M.: Bird Life, Appleton, 1898.

The bobolink of Utah did not learn their route in one generation ; they, in all probability, inherit the experience of countless generations, slowly acquired as the species extended its range westward. But how shall we account for the eiderduck, the wag-tail and puffin, wholly disregarding land forms in a portion of their route, and faithfully following them in others. Weismann, Darwin, Palmèn and others, believe that these routes are older than the present topographical conditions, that what is now sea<sup>1</sup> was land in a past geological age, furnishing way stations of food just as the littoral and fluvial routes do at the present time.

The study of route migration emphasizes two things, (1) that the migrating impulse is, at least, partly inherited. (2) That its antiquity dates back to former geological periods. It has also directed the attention of the movements of single species, and given hints on the relation of bird movements to food, but it does not account for the *origin* of the vast movements. Allen,<sup>2</sup> Spencer,<sup>3</sup> Darwin<sup>4</sup> and others say in substance, that the instinct grew out of a series of freezings and thawings of the glacial epochs, that bird life must have been crowded southward, and the struggle for life thereby greatly intensified. The less yielding forms may have become extinct ; those less sensitive to climatic changes would seek to extend their range by a slight removal northward during the middle intervals of summer, only, however, to be forced back again by the recurrence of winter. These incipient migrations must have been gradually extended and strengthened as the cold wave receded, and opened up a wider area within which existence in summer became possible. What was at first a forced migration would become habitual, and through the heredity of habit give rise to

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<sup>1</sup> This may be illustrated by the route taken by the crane and eiderduck from the mouth of the river Rhone to the shores of Africa. Instead of striking directly across the sea from the Rhone, they pass along the west coast of Italy, via Sicily, and from thence to Africa. It is pretty well established that the Mediterranean Sea was divided into two halves by an isthmus between Sicily and Africa, which birds followed in their migration north and south. This strip of land began to sink gradually, the flat places becoming bogs, and later so many little straits, the higher places would form a chain of islands, Sicily being the last surviving link in the chain. These bogs and islands instead of inducing the birds to change their course would, if anything, rather tend to strengthen their preference for it on account of the variety and quantity of food furnished by such land forms. So that by the time of a complete submergence the inherited tendency for this particular route would have become so strong that it impelled them to cross this vast sheet of water.

<sup>2</sup> Allen, A. J.: Scribner's Month., Vol. XXII, pp. 932-938, 1881; also Bulletin, Nuttall Ornith. Club, Vol. V, 1880.

<sup>3</sup> Spencer: Prin. Biology, p. 412.

<sup>4</sup> Darwin: Origin of Species, p. 342.

the instinct. Temperature and food are the principal factors in this theory.

The metabolism of the bird exceeds that of all other vertebrates. This calls for abundant and nutritious food, and especially during the breeding season. So vital is this relation that Wallace is disposed to regard the migrating instinct—"as<sup>1</sup> an exaggeration of a habit common to all locomotive animals of moving about in search of food." Indeed Hudson<sup>2</sup> has found that abundance of food may change the time of the breeding season.

<sup>3</sup> "In the island of Goree the swallows remain through the whole year because the warmth of the climate enables them to find food at all seasons." Allen<sup>4</sup> has shown that the distance traversed by the migratory kind in passing from their summer to their winter homes is in direct relation to their habits in respect to food. Yet while the effect of food upon bird life is direct and vital, it does not explain satisfactorily the periodicity of the impulse, the regularity to a day with which some birds return to their nesting places. In fact it does not account in many cases for the southward movements. The swift<sup>5</sup> and cuckoo both in America and England leave for the South when nature is in her richest abundance and the temperature fairly constant. Many birds leave their winter homes in the tropics in the height of the tropical spring when insect and vegetable food are daily increasing. They leave a land of plenty for one from which the snows of winter have barely disappeared, often coming so early that unseasonable weather forces them to retreat.

This advancing, checking, stopping suddenly or even retreating temporarily led Prof. Cooke<sup>6</sup> to study the relation between meteorology and migration. His extensive data suggests a correlation between successive "bird wave" or "migration wave" and the "warm waves" in the atmosphere. The investigation was not a complete one and is doubtless subject to errors and corrections.<sup>7</sup>

It seems clear in some cases that temperature exerts a direct influence upon their movements, but it sheds no light upon those very definite migrations that occur in equable temperature and abundance of food, *e. g.*, swift, cuckoo, bobolink. Many East-

<sup>1</sup> Wallace, A. R.: *loc. cit.*, p. 21.

<sup>2</sup> Hudson, W., H.: *loc. cit.*, p. 63.

<sup>3</sup> Ribot, Th.: *Heredity*, p. 16.

<sup>4</sup> Allen, A. J.: *Scribner's Month.*, *loc. cit.*

<sup>5</sup> Couch: *loc. cit.*, p. 138.

<sup>6</sup> Cooke, W. W.: *Report on Bird Migration in the Miss. Valley*, 1884-85.

<sup>7</sup> A further attempt has been made to represent graphically the migration of birds and the composition of the avi-fauna changing with the season. W. W. Stone, *The Auk*, Vol. VI, p. 139.



ern species move southward not according to temperature changes, but rather with respect to food changes.<sup>1</sup> Wallace and Chapman contribute evidence showing that temperature and weather elements in general have very little to do with the *time* of their arrival or departure. They consider temperature effective only as far as it effects food supply. The Pine Warbler's wide area (16 degrees parallel of latitude) of nidification is a case in point showing that temperature alone is not the factor that determines bird distribution and migration. Again, if food and climatic elements were the sole factors in originating the impulse, the periodic migrations within the tropics would remain mysterious, because, there, these factors are comparatively uniform throughout the year.

*Physiogenetic.* I think it quite probable, that, if a careful record of a bird's metabolism were kept throughout the year, and expressed graphically, it would show among other things two distinct elevations, a large one at the approach and during the reproductive period, and a smaller one at the moulting season. Facts are not wanting which lend this supposition some degree of certainty.

It is well known that both physiological and mental changes more or less varied, occur in nearly all species from crustaceans to and including species of anthropoid apes, during the pre-creative period. Darwin<sup>2</sup> in his thesis of sexual selection presents an immense number of facts on this point, especially on the changes that occur in secondary sexual characteristics. These changes reach their climax in birds. The voice, plumage, comb, wattles and weapons of various sorts are all brought to their greatest possible perfection. These secondary sexual changes are paralleled by more fundamental and important ones in the primary organs before their flight. In<sup>3</sup> the case of sea birds dissection shows an enlargement of the sexual organs before their flight — those of the male enlarge first. The deposit of eggs by the trout and salmon soon after their arrival to the spawning areas is evidence of ovarian activity even before migration began. The parturition<sup>4</sup> of the seal occurs within a day or two after her advent to the rookery. Stork,<sup>5</sup> geese, and members of the Hirundinæ<sup>6</sup> family display unusual activity previous to their flight.

These periodic "self-assertions" of the reproductive energy induce physico-chemical changes throughout the whole organ-

<sup>1</sup> Newton, Prof.: See article in Ency. Britannica.

<sup>2</sup> Dawin: The Descent of Man, pp. 270-555.

<sup>3</sup> Chapman, F. M.: The Auk, Vol. XI, 1894, pp. 12-17.

<sup>4</sup> Elliot, H. W.: An Arctic Province, p. 282.

<sup>5</sup> Swainson: *loc. cit.*, p. 261.

<sup>6</sup> Cauch: *loc. cit.*, p. 130.

ism, thereby ill-adjusting it to external conditions which before favored and promoted well-being. Influenced by this new development of organs and energy their very nature seems altered ; and while the climate they formerly delighted in has thus grown irritating and irksome, they feel a craving for one in which the procreative impulse may best be carried into effect. Similarly, the "moulting season" works physiological changes of the greatest importance for the individual. If the physico-chemical changes of the procreative period are in the interests of the species, the race, those of the moulting season are for the individual. During this season hens cease to lay, birds quit singing. Naturalists speak of them as "moping." Peafowls hide, courting and love antics cease. Rich<sup>1</sup> food and excited antics are requisite to the moulting process. "This feverish condition is accompanied with a higher degree of sensibility, which renders irksome and aggravating those impressions of the air which before were pleasing. An appetite for new kinds of food may be a natural accompaniment of this state of the body. The moulting process, *per se*, occurs in migratory birds as soon as they complete their southward journey. These considerations point strongly to the conclusion that both the *homeward* and *outward* migrations have a physiological basis, and that these processes serve as a stimulus to the nervous mechanism which discharges in terms, so to speak, of migrations. There are also two other motives associated with the breeding seasons that set in motion almost all forms of life. The first includes all those activities connoted by "sexual selection," the second is the search for suitable breeding areas.

Animals, which are at all other times solitary, including most carnivora, seek the opposite sex of their species during the rutting season. The lion, tiger and the entire family of Felidæ, both wild and domestic, lead solitary, selfish, vegetative lives, except during the season of love. The sexes of the arctic reindeer keep apart except at the courting season. The same is true of the wild turkey,<sup>2</sup> the grouse, and certain vultures of the U. S. The male chaffinches in Sweden never migrate. The females go south in September and return to Sweden in April, where they are fought for to the finish by the males. Pairing, according to Darwin, is effected by the "law of battle." Describing it among birds, he says, "when many males congregate at the same *appointed spot* and fight together, as in the case of grouse and various other birds, they are generally attended by the females which afterwards pair with the victorious combatants." The point urged here is that the desire

<sup>1</sup>Brehm, Dr. A. E.: Bird Life, p. 372.

<sup>2</sup>Darwin : Descent of Man, p. 416, etc.

for a mate or mates brings together periodically great aggregations of life, that otherwise would have met perhaps by chance. May not the desire for a mate and the repeated bodily experiences excited in what was at first accidental meetings and pairings have become permanently associated, so that the desire for a mate is immediately followed by a journey for one, or to the "breeding ground?"

The search for suitable breeding areas, it appears, is prompted by two causes: first, suitable food and shelter for the young; second, the well known desire that so many animals have for seclusion during the reproductive period. In fact nearly every species of the great backboneed series will seek at the approach of this season some retired part of their haunts or range in which to bring forth their young. Probably the second desire grew out of the first, especially out of the necessity for shelter for nest, eggs and helpless young.

The female of the reindeer<sup>1</sup> of Norway, of the common stag<sup>2</sup>, of the long-tailed deer of the British Isles, of several species of <sup>3</sup>monkey<sup>4</sup> isolates herself from her congeners and other forms of life for a fortnight or more during parturition. The annual<sup>5</sup> return of the seal to her "rookery," at the breeding season is absolutely necessary for the perpetuation of the species. The young seal from the moment of birth to a month or six weeks is utterly unable to swim. Especially is it necessary that birds should select safe breeding grounds, nests, eggs and birdlings are fragile, helpless objects, an easy and tempting prey to enemies. There is no wonder to be attached, then, to the fact that birds above all other creatures are most circumspect<sup>6</sup> about the location of their breeding sites.

In England the chaffinches and a host of other birds spend the winter in the open country but at the approach of spring come to the gardens, hedgerows and fruit trees because these places offer better security for nesting than the wood or heath. The starling spreads itself over the country of Cornwall in the winter and in the spring immense flocks desert their food area, though only to proceed to the distance of a few miles, for the sake of a place in which to hide their nests. Chapman mentions several species of tropical sea birds that resort each year to some rocky islet, "rookery," where they may nest in safety.

<sup>1</sup> Darwin: *The Descent of Man*, p. 503.

<sup>2</sup> Swainson: *loc. cit.*, p. 275.

<sup>3</sup> Hartman: *Anthropoid Apes*, pp. 247-48.

<sup>4</sup> Heape, W.: *Philo. Trans.*, Part I, p. 413, 1894.

<sup>5</sup> Elliot, H. W.: *loc. cit.*, p. 287.

<sup>6</sup> It is not to be understood that birds are conscious of the superior advantages of these sites any more than they are conscious of the fitness of the materials (grasses, hair, sticks or mud) used in nest building.

These movements are usually regarded as non-migratory, and yet the object is the same, and the migration as regular as that which prompts a wagtail or a puffin to wing its way from the Mediterranean to the arctic regions.

<sup>1</sup> Brehm says: "The act of migration stands in a certain way connected with the business of breeding and moult."

<sup>2</sup> Wallace has emphasized the necessity of separating the *subsistence* and *breeding* areas making food and safety during the nesting period the causal elements or initiative factors.

These two authors, taken together, correlate the reproductive and moulting processes and the instinct for seclusion with that of migration. To cover the facts of *periodicity*, of all real migrations, the immense *distance*, and *direction* of some of the routes, I should restate and add to the above theories in somewhat this fashion: *The incipient factors in originating the migrating instinct are the COINCIDENCES of the physico-chemical changes and the instinctive desire for seclusion and for suitable breeding areas with the periodicity of the seasons.* If it had happened that secluded and suitable pairing and breeding grounds had always been selected in an east and west line from their area of "subsistence," it is probable that the powerful instinct as we know it, would never have originated, because the *climatic* and food elements could never have co-operated with the procreative factors; on the other hand it appears as equally improbable that the instinct should have originated in the absence of the desire for seclusion or suitable breeding grounds or the ever recurring physiological changes which mark the annual cycle of bird life.<sup>8</sup>

This theory explains a number of facts connected with bird migration that are otherwise mysterious.

Males of many species precede the females in the northward journey; this correlates with the male sexual organs developing first. Birds that do not sexually mature the first year in the feeding area either migrate only a small portion of the way or not all. Barren birds of a migratory species remain south all their lives, only at times do they make a portion of the journey—doubtless due to imitation and the social instinct.

<sup>1</sup> Brehm, Dr. A. E.: *loc. cit.*, p. 368.

<sup>2</sup> Wallace, A. R.: *Nature*, Vol. X, 1874, p. 459.

<sup>3</sup> Chapman says—in the *Auk*, Vol. XI, 1894—"It is not improbable that the period of reproduction may have been coincident with the return of the warmer part of the year and in addition to the desire for seclusion and the pressure exerted by the crowded conditions of existence, which then prevailed (during glacial epoch), was potent in inducing birds to seek breeding grounds in the north during the summer. The only criticism offered against this theory is the time (glacial period) and the place (northern zones) it offers for the origin of the instinct. Arboreal tropical life is now believed by naturalists to be the natal home of birds.

The arrival to the breeding ground is much more regular and uniform than their departure, the latter is usually governed by the success of breeding. They come burdened with the great task of procreation which gives instinctive purpose and precision to their movements, they leave in obedience to vegetative functions. The theory accounts for their leaving breeding or feeding area when to all appearances temperature and food are ideal.

LOWER MAMMALS. Omitting the voluminous literature on this topic I shall mention only briefly the more significant facts.

Movements to which the term migration is applicable are seen in ten or twelve species of rodents, certain wolves and bears, several species of rēngulate and a few primates.

Classical examples of the instinct among rodents are the military-like advances of the squirrel, the hare and notably those of the lemming.<sup>1</sup> The movements begin in the spring or fall and may continue during severe weather. The object is apparently to enlarge their food area which is made necessary by an unusual multiplication<sup>2</sup> of the species and an unfavorable food season.<sup>3</sup> "Wolves<sup>4</sup> everywhere descend from the mountains to the lowlands in severe weather, and bears not infrequently migrate in great numbers to escape the rigors of an extreme winter.

Porcupines in Persia migrate north and south with the seasonal changes of temperature.

Reindeer and antelope, especially the latter, migrate in some countries as regularly as the fishes and birds,—the females of some species going farther north than the males.

Food, enemies and change of seasons influence the movements of monkeys.

On the whole it appears that, although the movements of the lower mammals are due to the same causes that control animals moving in air or in water, yet they are less precise, definite and periodical. True, unmistakable traces of the instinct are present, manifesting itself in flashes, as it were, sometimes impelling the creatures to destruction, *e. g.*, mouse and lemming.

#### *Domestic Animals.*<sup>5</sup>

For the sake of completeness, but more particularly for emphasizing certain observations made in the present section and

<sup>1</sup> Romanes: *Mental Evolution in Animals*, p. 282.

<sup>2</sup> Swainson: *loc. cit.*, p. 250.

<sup>3</sup> Heilprin: *Distribution of Animals*, p. 40.

<sup>4</sup> Wallace, A. R.: *loc. cit.*, p. 18.

<sup>5</sup> The material presented here is in answer to Rubric XIII of the syllabus. Two hundred and fifty cases were received on ducks, turkeys, chickens, cats, sheep, cows, horses, etc.

Doubtless they will seem very commonplace, so they are, but to

by way of introductory to the love of home, I treat here the migrating and homing phenomena of domestic animals.

FOWLS. 1. "I have observed that animals, such as cats, dogs, hens, hare, cows and horses are attracted to home life, while fish, ducks, turkeys and guineas are not—they like to wander."

2. "Our chickens often wander but are sure to return before night fall, while our turkeys always wander away, and sometimes they stay."

3. "Have known hens and turkeys to stay away during the day and lay their eggs in the fields or woods and come home at night."

4. "A neighbor had a hen that would come *to our place to roost* but always *went home to lay*."

5. "When we kept turkeys they used to wander from home; especially to build nests."

6. "When a hen 'stole her nest,' we found it hard to locate it, because the hen would not go to it when any one was looking."

7. "Have known Mrs. C. to watch her turkeys for two hours at a time to find where they laid. She was often compelled to follow them over a mile away into some underbrush."

The writer has performed the very monotonous juvenile task of following the wanderings of a turkey-hen until she saw fit "to take" her nest. If she detected my watching, her course was most often turned leisurely in the opposite direction, and she would postpone going on for several hours; sometimes, if watched too closely, she would not visit the nest that day. Usually when she "made up her mind" to go, she struck a bee-line for the nest as fast as she could run.

8. "Had given up one of my hens as stolen or killed, when to my surprise one day she entered the yard and presented me a dozen little chicks in a very 'fussy fashion.'"

9. "Have a number of times missed hens and gave them up for lost, but after some time they would come up with a few little chicks."

10. "We gave up keeping turkeys because it was impossible to keep them at home."

11. "It was very hard to keep ducks on the farm, although we had a brook and pond; they were forever gone,—would wander a mile or two below the house staying two or three days, when back they would come—as soon as fed and rested a day, away they would go again."

12. ". . . . Sold a couple of ducks to a neighbor three miles away. About a week after a tremendous noise in the yard awoke the household. It proved to be the quacking and gabbling of the ducks. Never before had I seen an animal make so great a display of pleasure."

13. ". . . . Drove my young chicks over a week old at evening into a new coop, but left the door open until late, as it was a very warm night. When I returned to shut the door of the new coop, they had all left.

the writer therein lies their value. The naïve innocence, simple-mindedness and freshness with which they are told precludes all suspicion that their observations were influenced by preconceived theories and biological conceptions as to the deeper significance of what they saw.

Going to the old one I found them all cuddled in a heap beside the closed door."<sup>1</sup>

CATS. 14. "My cat goes away frequently, stays three or four days perhaps—always glad to see us on his return."

15. "Our cat goes off for two or three days, and then returns. He is treated kindly and well fed, but just roams off, we can expect him within a week."

16. ". . . This cat used to go away every month, and stay about a week, then come back. Its journeys were regular."

17. ". . . Owned a cat that would stay in the woods for three months at a time, she would then return home with four or five kittens."

18. "Had a cat that would take care of her little kittens in an old basket at the next door neighbor's. She brought her kittens over home three times a day to be fed."

19. "When the little kitten of our old cat got big enough to run around we used to play with it a great deal. One day it disappeared. Thorough searching proved in vain. The old cat was around every day, but no kitten. One day the old cat was spied going across the field. I followed. She led me across two large fields to a patch of oats. Went to the edge of them and called. Out came that little kitten as fat as a butter ball. We think the mother hid it because we fondled it too much."

The last six cases are typical of 36 that illustrate a role by the procreative factor in wandering.

20. "Have observed that cats had much rather have one place in which to sleep."

21. "Cats will seldom leave permanently their old home, even after the family has moved away."

22. "When we moved into our new house we left behind a large cat that had been in the family for several years. My father was very fond of the cat. He would go down to the old house with food for the cat, but he would not eat. He howled day and night, but whenever any of us went down to the old place he would jump on us, roll over and purr, and act wildly glad. My father could not bear the idea of its grieving and starving itself to death, so the cat was brought to the new home. He was crazy with joy. He ran up and down stairs, on top of the furniture, rubbed against and smelt of everything, climbed up on us, walking right up our skirts into our arms, remaining but a moment, then down again, and following us about like a dog. After awhile he settled down and went to sleep."

Fifty cases like the last five were received on the home instinct of the cat.

Dogs. The following cases are typical of the wandering and homing instincts of dogs :

23. "Our dog went back to his old home, three miles distant, every Saturday night, and returned every Monday morning regularly."

24. "Owned a dog that was very fond of going off on long journeys by himself. Sometimes he would be gone two or three days, and would come home worn out and in every way ready for rest. After he had stayed home several days he would be ready to start out again."

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<sup>1</sup> I have before me numerous observations on the homing of pigeons, but such facts are every-day occurrences, as observations and current literature abundantly testify. The cases are therefore omitted.

25. "Had a dog that would travel a week, then stay at home a week, until finally he disappeared."

26. "Have a dog that persists in running away. Is kept tied, will leave home as soon as untied to go to where there is a dog. He will not go away during the winter."

27. "Know a dog that spends a great part of his time at a neighbor's, although his master is good to him."

28. "Dogs will often go off on journeys lasting two or three days or longer, but will return after that time."

29. "Brother bought a hound from an old man living some miles from our home. The dog returned next day. We went after him a number of times. Even after the old man died the dog would make trips to his old home."

30. "My parents owned a fine setter. They sent him to a farm forty miles away, to be trained. On taking him from the wagon when the farmer reached home, he got away and came home. He ran right up stairs into a room where my mother lay sick, putting his forefeet on her bed. . . . He was not to be driven from her bedside that night."

31. "A member of my family was a witness to the following incident: A farmer living near North Bend on the Ohio, transported his farm products on a flatboat down to Vicksburg. On one of these trips he took a highly prized dog. At the landing place at Vicksburg the dog disappeared. About a month after the owner had returned the dog came home poor and half-starved. He had travelled hundreds of miles, swam rivers, threaded forests, forded swamps and faced starvation to return to his home."

SHEEP. 32. "Flock of sheep in the spring have started about the usual time for the range where the older ones of the flock had pastured for two or three years. The pastures were on high hills, and the warmth and dampness of spring may have produced a degree of discomfort that reminded the sheep of the fresh pastures, breezes and hillside springs, where, shorn of their fleeces, they had enjoyed previous summers."

Cows. 33. "A man in our neighborhood has a cow that runs away from home. She will be gone for a day or more, and then will come back again."

34. "Our cow had spells of going away every month last summer."

35. "Mr. C. had a cow that would leave home every chance she could get, and would go into the country. Sometimes found ten miles away from home."

36. "A cow that will make her escape from pasture and return home, at a distance of several miles, at every opportunity."

37. "A herd of young cattle belonging to my grandfather escaped from a wild pasture about the last of September, and came home, a distance of twelve miles."

38. "Sold a cow to a man living about twenty-five miles away over rough hills and streams. She came back in a few days and stood by the gate until we let her in. She was again taken to her owner, but soon returned. It was very cold weather. We drove her away and made her stay outside of shelter, but without avail. Fearing she would die of hunger and cold we bought her back."

HORSES. 39. "Horses always come toward home faster. Have known very few to wander away from home."

40. "Horses become attached to home if it is one in which they are treated kindly. Know a horse raised and owned by one man until the horse was quite old. He was then sold to a person who kept



him, not far from his former home, but the horse was so homesick that he refused food and water, and would immediately start for home on being released. He was not allowed to return to his old home and consequently died of homesickness."

41. "Have known dogs, horses and cows, to suffer so intensely from evident homesickness, and so little food did they eat that great weakness and emaciation resulted. The diagnosis was confirmed by allowing such animals to be taken to their homes, when appetite and health promptly returned."

42. "Horses and cows will often wander in search of more or better food, but will soon return."

These cases indicate sufficiently the causal efficacy of food (case 42), temperature and seasons (32), in impelling domesticated creatures to wander; and likewise emphasize strongly that the procreative processes ill-adjust periodically, the organism to its home, and further, that along with these physiological changes are co-operating the instinctive desires for pairing and seclusion during the periods of nest-building, laying (cases 4, 5 and 6, etc.), parturition. In some cases the whole periods of gestation is one of seclusion (case 17). Cats, dogs, cows, and even horses will often hide their young (case 19), especially if one fondles or pays them considerable attention in any way. The many advantages derived by seclusion from members of their own and those of other species during this whole period are self-evident. A hen will lay in the woods, and come home to roost and feed. A cat will keep her kittens in a basket at the next neighbor's barn, but brings them home three times a day for meals, a cow nurses and conceals her calf in a thick copse, but pastures in the open field. Thus domestic animals, like the birds, often make an effort to separate the reproductive from the vegetative areas even during and after the period of gestation.

The periods of heat in the cat, dog and cow, are coincident with their leaving home. Doubtless the horse would prove no exception if he were allowed equal freedom. It appears that the periodical physiological changes of the sexual organs completely overpower whatever adjustment the organism may have effected on a vegetative basis, and impels it to seek forces that will restore its equilibrium. Good food, comfortable quarters and kind treatment (case 27) are no longer attractive. The male of both the feline and canine races leave their comfortable vegetative quarters to become the paramour of a female of their respective species, and this too in the face of repeated bitter experiences, strength challenged on every hand, deadly combats waged with other male suitors, many a kick and cuff delivered by man, and of privations and hunger continually besetting them.

The appreciation and love for home in domestic animals is wide spread and oftentimes very intense and pathetically ex-

pressed. A new cot, a new kennel, a new manger of strange smells and sights, a new master with new and strange methods of treatment produce at times acute cases of nostalgia in dogs, cats and horses.

The observations of this section indicate that temperature is the chief cause in the majority of fish movements, likewise of lobster and a few mammals, as squirrels, monkeys and porcupines. In so far as it affects the food supply it may be regarded as an indirect cause among all species. Food and atmospheric pressure seem to be the dominant forces among many insects, *e. g.*, locusts, grasshoppers, etc. The procreative instinct is operative in all the species considered save the lobster, and probably the locust. With certain land crabs, butterflies, fish and eels, all birds, many rodents and the wandering of all domestic animals, the procreative instinct, I am persuaded, is paramount.

No one factor acting alone is responsible for the instinct. It is the product of a nexus of forces co-operating and supplementing each other. But when the relative *intensities* of the many factors are considered, together with the circumstances and the order in which they operate, it appears that the procreative instinct is the initiative, the primal factor, and that cosmic forces give precision, definiteness, and periodicity to its expression.

#### SECTION B.

*Migrations of Primitive Man.* The present section is concerned with the wanderings of primitive man, to the end of exposing in rough outline the customs, habits and characters of a migrating people. The conception of the migrating instinct thus seen in the race may improve our position for interpreting the instinct as expressed by the individual.

Ethnologists,<sup>1</sup> generally, subscribe to the assumption that man must have begun his career on some fertile island<sup>2</sup> or region in the tropics.<sup>3</sup> While here his food consisted of the fruits and herbs of the forest. He was a frugiferous animal. Increase in his numbers soon forced him to migrate into regions less secure and blessed with a less genial climate. These forced movements compelled him to face a host of new conditions, *e. g.*, new climate, new food and a new array of enemies. As he migrated farther and farther away from the tropics the food supply came gradually to be seasonal instead of perennial. To secure food during the interim of the fruit bearing season he drew on the lakes and rivers for *fish*—his first artificial food.

<sup>1</sup> Morgan, Lewis H.: *Ancient Society*, p. 20.

<sup>2</sup> Lyell, Sir Charles: *Antiquity of Man*, p. 433.

<sup>3</sup> Mason, O. T.: *Migration and the Food Quest*. The Amer. Anthropologist, Vol. II, No. 3, 1894.

They "were universal in distribution, unlimited in supply and the only kind of food at all times attainable.

It is quite probable, too, that after coming within range of seasonal changes his dependence upon stream and forest for food compelled him to migrate back and forth to some extent with the seasons."

<sup>1</sup>Brinton says: "These periodical journeys extend hundreds of miles and embrace the whole tribe. This must also have been the case with primeval man when he occupied the world in paleolithic times. His home was along the shores of seas and the banks of streams. Up and down these natural highways he pursued his wanderings until he had extended his roamings over most of the habitable land." <sup>2</sup>Such is the case among modern primitive peoples who control as yet but few of the forces of nature.<sup>3</sup> While fish food rendered man to some extent independent of climate and locality he was forced to limit his excursions along sea shores and river courses until he had acquired sufficient skill with bow and arrow to kill his prey at a distance. Skill with these implements permitted distant excursions into the forest; fruit and fishing areas might now be deserted at a less risk of perishing from hunger. The chase became the highest of arts, the strongest incentive to wandering in all probability that man has ever received.

These three stages, the *frugivorous*, *fishing* and *hunting* furnished admirable conditions for the origin and growth of the *wanderlust* spirit. Their periods were *long* and the stimulus *intense*. There is much evidence from geology and paleontology showing that these periods may count their years by tens of thousands, that the transition from the frugivorous man to the nomad is many times longer than from the dawn of history to modern times. If psychic evolution has at all paralleled structural in point of time, there are strong reasons for believing that man was merely a fruit gatherer longer than a fisherman, a fisherman longer than a hunter, a hunter longer than a nomad and the latter longer than a farmer and homemaker in the modern sense.

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<sup>1</sup> Brinton, G. D.: *loc. cit.*, p. 74.

<sup>2</sup> Mason sets forth the view that America was accidentally settled by some remote ancestors of the red man who left their home in the East Indies in quest of food and crept slowly but surely along the coasts of China, Japan and Aleutian shores until they reached the shores of Western North America. Likewise Otto Sittig (Smithsonian Report 1895, pp. 519-35) says that the islands of the Pacific were peopled by compulsory migrations. The frail crafts of the natives of the Malayan Archipelago while in search of fish and other food were accidentally caught by contrary wind and current and carried to more distant islands.

<sup>3</sup> McGee, J. W.: *The Amer. Anthro.*, Vol. VIII, No. 4. 1895.

Victor Hehn says: "We cannot sufficiently estimate the slowness and difficulty of the transition from a wandering hunter's life to the taming and tending of cattle, nor of that from nomadic freedom to a settled domicile. Necessity must have been very pressing before the shepherd could resolve to dig up his pasture land, to sow grain, to wait for its growing . . .

. . . and so tie himself down to one spot like a prisoner and a slave. . . . In the same way the hunter felt cattle breeding a kind of slavery. Armed with bow and arrow . . . he freely roamed the woods. . . . If he had the luck to kill a wild bull, he could feast for days." Hunting must have become unprofitable, indeed, before the less skillful, hampering and humdrum arrangements of cattle tending were resorted to as a means of support.

Among the many factors arguing that man has and is passing through these several stages are those represented (1) in the primitive ways of the Tasmanian, Bushmen, many Indian tribes, Gypsies, Bedouin, and nations of the Mongoloid type; (2) by a large class of individuals in civilized society that neglect home life and throw off responsibility at every angle to become a planomaniac, a globe trotter, a Thoreau, a Robinson Crusoe, or a Captain Kidd; (3) by the atavistic activities of childhood, *e. g.*, fondness for water,<sup>1</sup> tree climbing, hunting trading and bartering, etc.

To get a composite view of the planomaniacal<sup>2</sup> type I quote from one hundred and forty-four cases<sup>3</sup> bearing on that sort of an individual.

1. F., 35. "Leaves home nearly every day immediately after breakfast to go visiting—is discontented and unhappy when compelled to stay at home."

2. F., 48. "On the go from morning till night—sometimes only running to see her nearest neighbor, sometimes going away on the cars—she keeps this up four or five months at a time, then suddenly stops and will not leave her yard for several weeks, nor does she care to receive company during her stay-at-home spells."

3. F. "Married, does not stay at home more than two hours during the day—spends her time in running about. She is young and does not have very much to do, perhaps she gets lonesome."

4. F. "Seems restless, is out calling every day—can't stay at home long at a time, although home and home-life is attractive and pleasant."

5. F., 50. "Married, educated, raised a family who are ignorant through neglect. Kind hearted, picks up and visits for a week, or will wait on the sick for weeks at the neglect of her home duties."

6. F., 30. "Good natured, smart, good cook and yet she allows her little girls to come home from school and prepare their own dinners. She leaves often after breakfast and does not return till bed time. She does not seem to do it to get rid of work, as often she will

<sup>1</sup>Truancy, *Ped. Sem.*, Vol. V, No. 3, pp. 396-419.

<sup>2</sup>Rubric VIII of Syllabus.

<sup>3</sup>Ninety-five per cent. reported are females.

be helping some one to do just what she has left undone at home." (Many cases of this kind.)

7. F. "Married, quick and active, will take one child in her arms and have the others following after. Household duties do not worry her in the least. She says life is too short to waste it in the house."

8. F., 30. "Has a fixed day to visit each of her friends every week—can't be found at home more than two days in the week."

9. M., 52. "A comfortable home, good clothes and food, but will not stay at home. Always finds some news to carry from one place to another, and *is always ready to eat.*"

10. F. "Has a large family, always on the go in all sorts of weather, will keep her children out of school to stay with the little ones. Her calls are of a gossiping-seeking sort." (Five cases of this nature.)

11. F., 50. "Not interested in the duties of home, neglects them to go calling, cannot bear to be alone."

12. F. "So fond of calling that she will bring her cooking to our house. There is no special reason for her doing so."

13. F., 50. "Married, four children, always on the street, or shopping, will visit the same store several times a day."

14. F., 25. "Unmarried, never satisfied at home, has no taste for reading or domestic life. Loves to talk and carry news."

15. F. "Always making calls. I think it is to find out other people's business. Is the first to call on a new neighbor."

16. F., 40. "Always on the street, delights in gathering and redistributing news." (Cases like the last three are most numerous.)

17. M., 48. "Neglects his family and farm to talk with neighbors, is fond of trading horses, etc., visits all public gatherings."

18. M., 56. "Had a good farm and well stocked, suddenly abandoned it to his family, and went calling from neighbor to neighbor. Fond of children, well read, would work hard for a neighbor, but would never receive any pay—would only occasionally do a hard day's work at home."

19. F. "A member of every club and society in which she can gain a foothold, dips into everything, has done a little of everything, fond of doing committee work."

20. F., 30. "Neglects home to visit and be with other people. Good to sick and needy, will do menial work away from home that she will not do at home. Is fond of going to weddings, funerals, parties, etc."

21. F., 30. "Is noted for going to funerals and public gatherings of all sorts."

22. F., 40. "Always looking after the needy and sick, a great church goer, attended all week and Sunday meetings, and all funerals that she possibly could. Her friends once saw her going to the funeral of a noted pugilist, though they could not understand how she could possibly be interested in the deceased."

The funeral and club goers form somewhat a separate group, yet illustrate the lack of home interests and aversion to static conditions.

24. M., 22. "Married, seldom at home, fond of horse trading."

<sup>1</sup>The impotency of the home spirit, the desire to lead a semi-roving life and the attendant psychoses of such a people are

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<sup>1</sup>Rubric VI of Syllabus. 217 cases reported, 23% of which were forced to move because of a failure to pay rent.

further illustrated by people who move frequently. The following are instances of families who move often for some other cause than failure to pay house rent.

25. "A lady and her daughter spend much of their time looking for a new boarding place. They are rich and hard to please."

26. "A farmer, lost a good farm by bad management, has tried several occupations, is discontented, moves every year to a new farm."

27. "M. moves about every two years, always to a different part of the same town. He is always changing his occupation."

28. "Husband indolent with little business ability, wife is ignorant and slovenly, move twice a year. It has come to be a habit."

29. "This family is never contented, think if they could be in some other place all would be well. Within four years they have moved seven or eight times."

30. "This family moves every spring and fall. The man has very poor calculation and generally thinks that if only he were *somewhere else* he might do great things."

31. "This family moves to avoid cleaning house. They endeavor to move into one already cleaned."

32. "This farmer has moved every year for 28 years, moved every spring thinking he would get a better farm."

34. "A lady has moved four times in five years,—although she owns several houses, she lives in a rented one. She is a very restless person."

35. "This family moving into a new place think it delightful and can't praise it enough. They soon grow dissatisfied and move again. They move back and forth from city to country. They are always in an unsettled frame of mind and think they can do better *somewhere else*."

36. "Each time this family moves, they think they are getting a better place. They move every two or three months. They have moved from a house and then back to it again in a few months."

37. "I know many families who move frequently. They always think the new tenement, which may be no better, has some advantage. They do not often get less rent, neither do they leave unpaid rent behind; sometimes they do not even change landlords, nor do they go beyond a radius of a mile for years."

38. "Have known this family for twenty years. They move on the average every six months. They have always lived in the same city, pay their rent—are respectable people. Each time they move they paint, varnish, and paper throughout, build new cupboards and begin cultivating grass and flowers, only to be left in a few months for another neighborhood."

39. "Family of four, all well educated, are continually moving about, from one part of the city to another; they will have a very nice home for about a year, then sell all their furniture and begin boarding. After a short time they become dissatisfied, buy new furniture and go to housekeeping again."

40. "This family is not content to remain long in any one place, grow tired of house and surroundings. They are nice people, much respected."

41. "This family moves about because they never like their neighbors. They usually move two or three times every year."

42. "I know a man with a family of nine, moves from two to five times a year. He is a horse jockey, works but little, loafs around the post office, stores and other places." (Eight cases of this character.)

43. "They move about every four months, are regarded as shift-

less, unstable in character, contented in one place as long as there is novelty, but soon become discontented and move." (This "shiftless" class forms 18 % of the number who pay their rent.)

44. "My grandfather would never stay in one house more than six months. He said he got tired of seeing the same things. They say he was just the same when a boy, was always changing his room and rearranging things. As a young man he was always changing his boarding place."

The planomaniac flees from domestic cares, has no interests for modern civilized ways, and will not fuse with them. He could not, if he would, for he belongs (using geological analogues) to a different and earlier formation. We should not wonder at his dread of solitude (cases 3, 4, 5, 11), at his being lonely in the midst of modern environment. To such his mind is vacant, hence his pursuit for diversion, and search for his *kind*. Zimmerman<sup>1</sup> says "Vacant souls are always burdensome to their possessor; and it is the weight of this burden that impels them incessantly in the pursuits of dissipation for relief." How primitive and semi-roving are these traits: "always ready<sup>2</sup> to eat" (case 9), desire to barter<sup>3</sup> (cases 17, 24), working<sup>4</sup> by fits and starts" (case 18), "shiftless" cases (cases 28, 42, 43), "slovenly<sup>5</sup> and unkempt in person," indifferent to and with seeming inability to fight dirt.<sup>6</sup>

It appears, too, that the desire to rove is not abated with advancing age, not even with the increase of domestic and business cares. The cases cited indicate that there are persons in the midst of all degrees of intelligence and culture that minimize the value of a permanent home, that persist with seeming delight in a roving and nomadic life. Their lives are devoted in searching for the new, getting acquainted with the unfamiliar, gathering and distributing news, and dipping into new enterprises. They are possessed by a consuming curiosity, frequently of the idle sort.

The concomitancy of the roving and curiosity instincts in the same individual suggests a common origin, if not a causal relation. The conclusions<sup>7</sup> of naturalists<sup>8</sup> and genetic psychologists<sup>9</sup> are to the effect that curiosity arose from the hunger and fear

<sup>1</sup> Zimmerman: Solitude, p. 12.

<sup>2</sup> "These Indians are disposed to gluttonize in idleness, when opportunity arises, when their power for consuming is no less striking than their power of abstaining. This characteristic of the tribe is possessed by other primitive peoples." W. J. McGee, Amer. Anthro. Vol. VIII, No. 4, 1895.

<sup>3</sup> The Bedouins possessed this trait in a high degree. See Ency. Brit

<sup>4</sup> Ellis Havelock: The Criminal, p. 101.

<sup>5</sup> Lubbock, Sir John: Prehistoric Times, p. 432.

<sup>6</sup> Bancroft, H. H.: Native Races.

<sup>7</sup> Darwin: The Descent of Man, p. 71.

<sup>8</sup> Romanes: Animal Intelligence, p. 279.

<sup>9</sup> James: Psychology, Vol II, p. 429.

instincts. The motives for animals to investigate the unfamiliar, it would seem, are twofold, (1) to see whether or not the object in question is harmful, (2) to see whether or not it is palatable. Likewise the passions for excessive call making, gadding about, "the first to call on a new neighbor," continual shopping (but rarely purchasing), sampling and "sizing up" the material and mental furniture of a newcomer may have originated out of the necessity, common to all organisms, to know what is harmful and friendly, nourishing and distasteful in their *milieu*.

Interwoven with this curiosity plexus of motives, sometimes separated from them, is a longing for the unexpected, moving with the hope, Micawber-like, "That something may turn up," imagining that the other side of the road is always the better. They have an insatiable desire for conjuring with that unknown factor that lurks in the untried, to commit their fortunes to the play of the mysterious and unconscious forces of the universe which to so many lend an irresistible charm to a new game, new neighbors, a new house, a new farm, a new position, a new enterprise. In gambling it is the element of chance, in trading and barter it is termed luck. Hence it is that we find so many of these people doing a shiftless, bartering and gambling business where the conditions of chance and luck have their fullest swing. In all probability these conditions were at their best during the life of the primitive hunter and trapper. Here the degree of probability that labor will be proportionately rewarded is at a minimum. The ratio of reward to labor becomes so infinitely small that he comes to regard his rewards and successes due to chance rather than personal effort. One should not wonder, then, at barbarous and semi-civilized people persistently and continually creating conditions in which chance is at a maximum. Trapping, hunting and fishing are pursuits that reward more by chance than deliberate effort or certainty. Daily bread is the reward of *one lucky* arrow, spear, trap or net out of a hundred of such instruments and not by the sweat of the brow. The psychology of longing to be in some other place, for new conditions, for speculating, for gambling, is a reassertion of the old associations between chance and reward formed when the welfare of man was largely dependent on the mysterious forces of chance.<sup>1</sup>

Probably the gypsy is the best type of a wandering people

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<sup>1</sup>The origin of many forms of gambling, and games of chance and lot as opposed to skill among the Chinese, Koreans, North American Indians and many other primitive tribes, lends considerable support to this theory, in that they all can be traced back to throwing the arrow, or tipped and feathered bamboo reeds as well as species of dice. . . . See Stewart Culin: Korean Games.



who have kept intact the customs and habits that once universally prevailed. The gypsy<sup>1</sup> that we know is quite different from those of other countries in their manner of getting a living. In Egypt they practice the art of serpent charming and conjuring ; in France and Spain the girls sit as professional models ; in England we meet Gypsy Methodist preachers, actors, quack doctors, chimney sweeps, carpenters, factory hands. In every land the men are workers in metals, musicians and horse-jockeys ; are never scientists, barristers, or men of large affairs. In this country they travel about over the country in light-running canvass covered wagons, laden with their goods and chattels. They subsist by fortune-telling, horse-jockeying, tinkering, sometimes by selling small articles, trading, gambling, by theft and deception. They are dirty<sup>2</sup> both in person and cooking, lazy, fond of drinking and smoking. They are charmed by gaudy dress and jewelled ornaments. In no country have they ever been known to farm. A few own land in this country, but they seldom occupy it, preferring the wagon and highway instead. They keep both dogs and horses, being very fond of the latter. They have deep emotions, enjoy life, are highly imaginative, and extremely fond of music.

The gait of the gypsy is not jerky, angular, and individual, but rhythmical, racial, swaying from side to side, generating, roughly, from the hips up, sections of an inverted cone. The negro has a similar gait. This animal-like motion is due to the dominance of the fundamental muscles in walking as opposed to the finer, accessory muscles that stamp individuality upon the Caucasian gait. Prof. Shaler observes that the gypsy will not follow the sidewalk and brick pavements. They prefer the middle of the road.

The origin, together with the traits of a wandering people, have thus far been sought in the vegetative, the food getting side of man. There are impulses and irradiations from the reproductive functions whose significant bearing on the wandering instinct call for consideration.

The evidence furnished by Bancroft,<sup>3</sup> Westermarck,<sup>4</sup> School-

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<sup>1</sup> For an extended account of the probable origin and customs of gypsies, see histories by C. C. Leland, or George Borrowes.

<sup>2</sup> This is not universally true as the following will show, quoted from a competent observer : " This party of gypsies were scrupulously clean, had lots of silverware, dishes, etc., all of which were as clean as could be. The children, too, were cleanly and neatly dressed."

<sup>3</sup> Bancroft : *Native Races*, Vol. I, p. 351.

<sup>4</sup> Westermarck : *The History of Human Marriage*, p. 34.

craft,<sup>1</sup> Hill,<sup>2</sup> Ellis<sup>3</sup> and others, indicate strongly that in one stage of human evolution an annual pairing season took place in the spring or early summer months. Westermarck, after an exhaustive research on this subject, says: "It is, therefore, a reasonable presumption that the increase of the sexual instinct at the end of spring or in the beginning of summer, is a survival of an ancient pairing season depending upon the same law that rules in the rest of the animal kingdom." The evidence of the preceding section shows that there is an intensity increase in the human sexual functions during the spring, not yet suppressed by law, religion and social customs. There is every reason to believe that pairing was decided by the "law of battle." This archaic habit is known in anthropological literature as *wife capture*. That this custom was once general, if not universal, is inferred from the symbols<sup>4</sup> of capture<sup>5</sup> that are so wide<sup>6</sup> spread among all peoples<sup>7</sup> at the present time. Several mythic legends, as Pluto and Proserpine, Boreas and Orithya, Theseus and Helen, the Romans and the Sabines have in all probability their foundation on the custom of systematic capture of wives among such ancient races.

The desire for, and methods of selecting a mate inaugurates practically the same activities as are displayed by lower creatures when accomplishing a similar purpose, viz., the "law of battle" and wandering. Olaus Magnus<sup>8</sup> represents the tribes of northern Europe, as continually at war with one another, either on account of stolen women, or with the object of stealing women. In Australia the capture of wives is a signal for war, and as the tribes have little property, except their weapons and their women, the women are at once the cause of war and the spoils of victory. The same is essentially true of the Bonaks of California, the Tasmanians and Maorians. The coin-men of Patagonia make excursions every year at the time of "red leaf" from the mountains in the north to plunder Fuegians of their women, dogs and arms. McLennan thinks that the modern groomsmen or "best man" is the legitimate descendant from the early fighting and protecting protegee of the bridegroom.

War waged for any cause whatever, necessarily strengthens

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<sup>1</sup> Schoolcraft: Archives of Aboriginal Knowledge, Vol. II, p. 224.

<sup>2</sup> Hill, A. S.: Nature, Vol. XXXVIII, p. 250.

<sup>3</sup> Ellis, A. B.: Popular Science Monthly, Vol. XXXIX, No. 2, pp. 207-22.

<sup>4</sup> Westermarck: *loc. cit.*, pp. 283-402.

<sup>5</sup> Wood, Edward J.: Wedding Day in all Ages and Countries, 2 vols.

<sup>6</sup> McLennan, J. F.: Studies in Ancient History, Chapters I, II, III, IV, V.

<sup>7</sup> Ellis, A. B.: *loc. cit.*

<sup>8</sup> Quoted from McLennan's Studies in Ancient History, p. 55.

the wandering instinct—the aggressor in pursuit of his prize, and the aggressed exchanging domestic duties for those of defense and regaining losses. Out of such conditions arose the themes of the greatest poems of antiquity, those of Homer and Virgil have made Ulysses and Æneas classic wanderers for all time. Peggotty wandering in search for Emily, Adam Bede's false betrothed tramping the highway in bitter shame and remorse, the untiring search of Evangeline for her lover over an entire primeval continent, St. Elmo's aimless wandering after killing his rival, are all mental creations that do no violence to human nature. Indeed tragedies and romances are most often the cradles of future wanderers.

The art of wife getting attained its most delicate and refined form in the 11th and 12th centuries, as set forth and practiced by the Troubadours and Courts of Love.

So charming and seductive were their lives and methods of wooing, that every nobleman of any merit, many princes of royal blood, and even four kings became ardent devotees. Love was their theme, their Alpha and Omega, music and wandering the methods of its exposition. They write: "It<sup>1</sup> is love that makes me sing." "For sweet love do I labor night and day in the improvement of my lays." "For love sing the birds, and for love sing I." Says Rowbotham: "The leading and characteristic feature in the life of every troubadour was, that he was expected 'to go through the world,' . . . 'to go from court to court.' At the *first breath of spring* (italics mine) the troubadour mounted on his steed . . . sallied out in quest of listeners, and prepared to indulge in what adventure might befall him on the way."

That the activities and attendant passions of (1) the annual pairing seasons, (2) of wife capture in its various forms and consequent wars, (3) of the various forms of symbolism of wife capture and (4) of the ever recurring romantic episodes among civilized peoples everywhere, have impressed the human soul, and have differentiated it in a special way is highly probable. The product of this differentiation is the instinct that impels man to desert home and vegetative stores and seek a world where the procreative functions and its higher irradiations may assert themselves. It would be absurd to interpret the precocious runaways of adolescence, the roving life of many individuals or the life of the vagrant as a direct expression of the procreative functions seeking conditions for satisfaction as witnessed in wild and domestic animals. Scott<sup>2</sup> has argued that these fundamental passions may be irradiated, long-circuited or trans-

<sup>1</sup> Rowbotham, J. Frederick: The Troubadours and Courts of Love, p. 226.

<sup>2</sup> Scott: Sex and Art, *Amer. Jour. of Psy.*, Vol. VII, pp. 153-226.

posed into a hierarchy of activities ranging all the way from the gross sensuous impulse of a marauder to the idealistic sentiments of youth that urges him to go forth espousing freedom's cause, waging war to reclaim a holy shrine, or to a missionary in any good work. Between these two extremes may be mentioned passions to start life, seeking wider liberties, for adventure, yearning for space, for solitude and the like.

The impulse to go off at the approach of the menstrual<sup>1</sup> period, the desire for seclusion during parturition,<sup>2</sup> and the passion for a wedding tour can only be mentioned here as subjects for investigation. No adequate data exists on this phase of the subject.

*Historical Migrations.* This subject presents three items of interest, (1) the degree of civilization of a migrating nation en masse, (2) the direction of the route, (3) the climatic conditions of the country from which the nations move, and of that to which they go. The organization of a migrating people has usually been of a comparatively high<sup>3</sup> state. They have been skilled in the several arts of war, in making and using weapons, and in handling great bodies of men. According to Von Hellwald<sup>4</sup> the direction of the migratory streams will be found always to lie in the axis of the greatest longitudinal extension of the continent. The historical migrations<sup>5</sup> in the old world have been from the high plateaus of Eurasia in the east to the narrow land areas in the west. In America they have proceeded from the broad land areas of the north to the mild tapering peninsula of the south. Doubtless the mountain ranges that lie in the long axes of continents determine to some extent the direction. Both the temperature and wind of large water areas are more uniform than that of great land areas. Countries, therefore, wholly or partially surrounded by water areas, or that are so situated as to have their shores bathed by strong sea currents, and their surfaces blown over by winds coming from large sea areas, enjoy the most delightful climates in the world.<sup>6</sup> The countries along the shores of the Mediterranean Sea, south-

<sup>1</sup> The writer is informed by a student of psychology that his wife when a girl in her teens at home and at college experienced a vague impulse "to go off," not to hide specially, but to be alone, a few days before each monthly flow. Several girls of her intimate acquaintance professed to her a like experience.

<sup>2</sup> When the time of a Schoshone woman's confinement draws near, she retires to some secluded place, brings forth unassisted, and remains there *alone* for about a month. Bancroft: *Native Races*, Vol. I, p. 437.

<sup>3</sup> Lubbock, Sir John: *loc. cit.*, p. 586.

<sup>4</sup> Von Hellwald, Frederick: *The American Migrations*, Smithsonian Report, 1866, pp. 328-45.

<sup>5</sup> Cram's Universal Atlas, p. 269, 1893.

<sup>6</sup> Davis, W. M.: *Elementary Meteorology*, p. 338, 1894.

ern California, portions of Chili, etc., are freed from extremes of temperature, winds, and floods and frequent undulations of atmospheric pressures. England, East China and Japan are lands whose climates, though in the great land areas or just adjacent to them, are tempered and uniformed by sea winds and currents. In such countries, *e. g.*, Egypt, Japan, East China, Greece and Rome, are found the oldest and most permanent institutions of man. In them civilization was cradled and wrought out the deeds that form the bulk of history.

On the other hand the great land areas of the N. temperate zones are characterized by wide annual ranges of temperature, in some regions long drouths followed by short but heavy rainfall, and by a wide spread and frequent undulations in atmospheric pressure.<sup>1</sup> Such climates are found on the eastern and southern shores of the Baltic, the northern lands of Russia, northern and central Asia, and the large interior of North America stretching north of the Missouri and northwest of the Great Lakes. The Steppes of Turkestan, the great desert of Gobi and Takla-Makin<sup>2</sup> with moving dunes of sand, portions of Arabia and Persia are all dry lands with a relative large range of temperature.

The uncertain changeable geographico-climatic conditions of these land areas, it seems, would foster and emphasize the several migrating traits already surveyed, would furnish just the right stimuli to set agoing from time to time the old migrating instinct implanted in the race in prehistoric times. Such lands cradled the Tartar, the Hun, Visigoth, Vandals, the Bedouin—the children of want and hard circumstances, the hardy, brawny, restless races, in whose blood there is a good mixture of iron, and which have come forth *periodically* to destroy the luxurious and the wealthy,<sup>3</sup> to lay in ashes the arts and culture that flourish where the forces of nature are more uniform and less rigorous. At the present time, according to Tarde<sup>4</sup> and Below, the life of the pastoral people in the Sahara, as on the plateau of central Asia, is passed in circular migrations, returning to their points of departure. He thinks that caravan life, like sea life, has incited others to a roving life through *imitation*. Commerce conducted in any form whatever, as caravans, railways or ships, is a powerful stimulus to wander-

<sup>1</sup> For physiological effects of elevated climates, frequent undulations in atmospheric pressure, etc., see Hand-book of Medical Climatology, p. 61, by Dr. S. Edwin Sully, also Warren P. Lombard in *Amer. Jour. Psy.*, Vol. I, pp. 5-71.

<sup>2</sup> Heden, Dr. Sven: McClure's Magazine, Dec., '97. "It was all sand-moving dunes of sand. The days were very hot, the nights were bitterly cold. The air was full of dust."

<sup>3</sup> Holworth, Sir H. H.: History of Monguls, Chap's II and III, Part I.

<sup>4</sup> Tarde, M. G.: Revue Scientifique, Vol. XLV, p. 747, 1890.

ing. The tenacity with which trainmen cling to the railroad, the stolid backwardness shown by the Mississippi River steamboat employees to quit boat life and enter other pursuits, are instances justifying Tarde's conclusions. A commercial people are cosmopolitan—rarely if ever homesick. It would seem that certain occupation predispose to restlessness and roving.

TABLE III.  
*Showing the relation between the age and the manner and causes for leaving home.*

Age.	Male.	Female.	No. totals.	Injured feelings.		Love of adventure.		Love of nature.		To start life.		Impulsive.		Planned.		Loneliness.		To see opposite sex.	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	2	3	5									5	100						
2	6	5	11									11	100						
3	17	9	26					3	11			20	77	4	15	12	46		
4	15	8	23	3	13			3	13			19	82	4	17	10	43		
5	19	15	34	4	11			4	11			27	79	7	20	12	35		
6	13	11	24	4	16			8	33			14	58	8	33	6	25		
7	18	7	25	3	12			6	24			12	48	9	36	4	16		
8	26	5	31	4	13	4	16	12	38	1	4	12	38	11	35	5	16		
9	18	8	26	5	19	7	27	19	72	3	11	11	42	14	54	4	15		
10	32	6	38	10	21	17	44	12	31	4	10	19	52	14	36	0	0		
11	11	3	14	4	28	6	42	4	27	4	10	11	78	3	21	2	14		
12	28	6	34	11	32	14	41	4	12	4	11	16	47	15	44	2	5		
13	33	8	41	9	21	20	48	5	12	9	21	15	36	22	53	3	7	1	2
14	38	5	43	12	28	20	46	4	9	8	18	16	37	25	58			2	4
15	44	8	52	19	36	22	42	4	7	10	19	18	36	29	58			4	7
16	26	4	30	8	26	16	53	2	6	9	30	8	26	20	66			4	13
17	12	6	18	4	22	9	50	2	11	4	22	5	27	11	61			3	16
18	15	2	17	3	17	8	47			5	29	3	17	12	70			4	23
19	7	1	8	1	12	5	62					2	25	6	75			2	25
Total,	380	121	501	104	27	154	30	80	13	61	12	253	50	214	42	60	12	20	4

*The Instinct in the Individual.* The migratory instinct, together with the concomitant traits, so far as they can be

made out in childhood and early youth, were treated at some length in my paper on Truancy.<sup>1</sup> It remains to note briefly in the light of all that has preceded the role played by the instinct in maturer<sup>2</sup> life. Our study thus far suggests that its germs are perhaps in every one—at least such is the view here adopted. The instinct is not an anomalous thing. It had a legitimate birth, and is an essential function of the soul. At what age or ages, under what conditions it will most probably control one's activities, and what will be its form of expression, *i. e.*, whether seeking a fortune, love of adventure, or fleeing from restraint, or what not, are suggested from the returns of the questionnaire,—Rubrics I and II.

For total number of cases of runaways, number of each sex, distribution according to age, and the relation between ages and the different causes for running away, see Table III and Chart IV. The manner of running off is partly a function of age (Chart III). All children that run off from one to three do so impulsively.<sup>3</sup> Three to eight years shows a gradual falling in the impulse curve with a rise in the planning curve (Chart III). The child's growing interests and respect for home and parents' and the consequent desire to conceal his misdemeanors are probably factors at work here. From eight to twelve the curves are reversed. This corresponds roughly to the period of slow growth of brain, body, weight and height. It is a time, too, when the child partially slides out from under the sole care and companionship of parents, and sets up a social circle of his own. He is less sensitive and considerate to his parents' reproofs and wishes. Respect weakens, he waxes bold, questions authority. This dare-devil spirit may account for the child doing things impulsively, openly and above board. The ways and manner of leaving home, however, multiply with age. The curves (Charts III and IV) showing the relation between ages and different causes for leaving, are based on too small a number to merit a detailed description; they do, however, emphasize this fact, that childhood and youth are affected differently by the same causes, and further that the causes in-

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<sup>1</sup>Truancy as Related to the Migratory Instinct: *Ped. Sem.*, Vol. V, No. 3, 1898.

<sup>2</sup>It is needless to say that the data for a thorough study is yet to be collected. There is much literature of an idealized sort, descriptive of the professional tramp. But the tramp by no means expresses all of the roving instinct—not all wanderers are tramps. Indeed, if adhering to fixed habits, customs and conditions excludes the roving instinct, then the tramp is not dominated by the migratory impulse, for he is exceedingly staid in all his ways. A study of tramps and vagrants, then, will not suffice our present purpose.

<sup>3</sup>See cases and comment: *Ped. Sem.*, Vol. V, No. 3, pp. 387-90.

crease as the individual comes to sustain wider and wider relations with society. For example, injured feelings in childhood may arise through an unfavorable comparison of their lot with that of their playmates, and from real bodily wrongs, or from objective conditions and processes while the feelings of adolescence are generally disturbed by subjective and imaginative conditions. His moulting ego is excessively sensitive to personal rights and honor, his good intentions are misinterpreted. The injured feeling curve attains its maximum in the fifteenth year. Again, childhood and adolescence are affected diametrically opposite by solitude. The former flees from loneliness, the latter often seeks it. Childhood goes to nature (Chart IV) for companionship, adolescence for solitude.

Probably one of the most faithful sources of wandering in adolescence is restricted liberty, or impatience under restraint. The following are two cases from more than a hundred bearing on this point.

1. F., 34. "Until I was twelve, I cannot recall having ever gone from home with pleasure, but during my early teens I began to feel a sense of oppression from remaining at home which became highly accentuated by the age of fifteen. I was then allowed to leave home to teach a little rural school. The sense of freedom I experienced was intoxicating (and not mildly). Yet I was under no real restraint at home. I simply felt restrained there. I think I had an irritating desire to find how I *alone* stood with the world, to feel myself detached from all that bound me. During this time I thought much of 'independence,' delighted in long lonely walks—often pictured to myself the freedom of the gypsy and delighted greatly in all tales and poems idealizing the gypsy girl."

2. F. "The noise of a city and the crowds of people always make me impatient to get away. I don't like even a day with houses in front of me—even brown stone, vine wreathed, is a burden to my spirit. I can get along in a very small room for myself and my belongings but I *must* have some space outside my window. When I had to live in the city I had such longings to escape that I would take a car in dead of winter and go to the end of the route and then walk until there was not a house or a person in sight and so get my equilibrium."

A student of tramps and vagrants writes me :

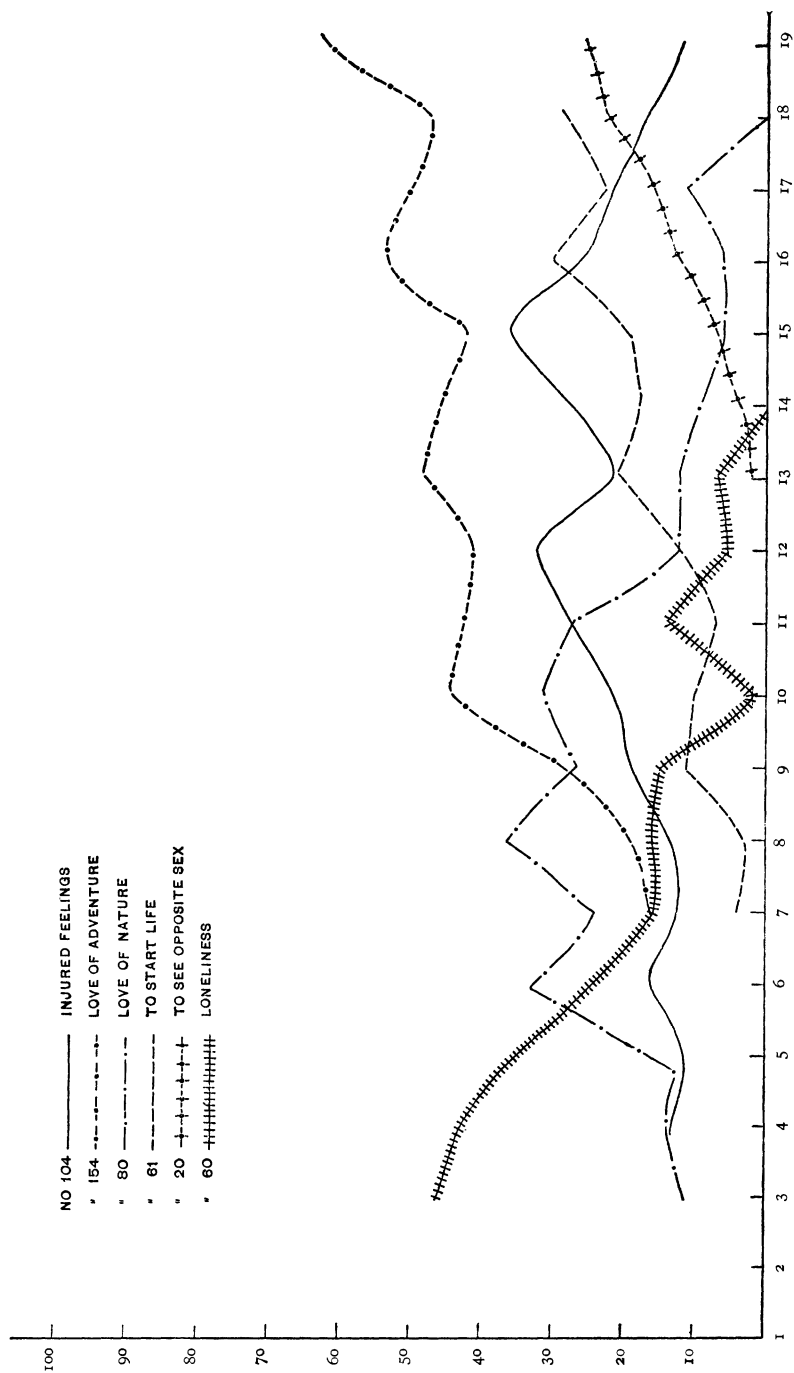
"It is my impression that the narrow, cramped conditions under which boys often live, without sufficient variety and wholesome interests in their lives, is responsible for much of the constant recruiting in the ranks of the tramp army. It is unnatural for young people to live a life of dead monotony, and the boy who breaks away in sheer desperation, without an education to equip him for any better life, soon drifts to trampdom and becomes irreclaimable to serious life."

While the charms of travel woo many to a roving life, travelling, especially on water, cures many of a roving passion. The following are from 280 cases of Rubric IV on the charms of travel :

CHARMS OF TRAVEL. 3. M., 26. "I enjoy a walk into far away country places for the sake of the sensation of delicious freedom, of



CHART IV. *Showing the relation between ages and the different causes for leaving home.*



the perfect mental abandonment. One feels as if he had shaken off the dead weight of mental contact, and the far off stretches of country promise more of the same kind of liberty."

4. M., 24. "I like being aboard a ship for the feeling of endless space and a sort of liberation from conventions that it brings. A long walk into a new part of the country has a charm for me. And I have enjoyed herding cattle on the prairie because it set me free from self-consciousness."

5. F., 33. "Have often felt as though the house, although comfortable and handsome, was choking me, and the moment I got my foot on the doorstep for a walk, even though a deep snow prevailed, I felt better. I feel intense pleasure when walking in the twilight—alone, have an elasticity of step and elation which makes me wish twilight would last for hours so that I could walk miles. Am in no sense a gad-about, and I hate call-making, but cannot hear the whistle of a locomotive without a tingling of the blood and a longing to be off—indeinitely, anywhere. Have led a sedentary life."

6. F., 21. "Either a trip on the ocean or a long ride on the train has great interests for me. The former soothes, puts me at peace with the whole world; the latter excites me, I feel boisterous, can hardly keep still, no matter how peaceful the scenery, it seemed that I could always see something wild about it, something that answered to my feelings."

7. M., 26. "The chief interest of travel to me is the seeing of new things. My hobby in the way of change is to get out into the country for about two days at a time, drop everything, cut loose from every thought that binds me to my work and walk in the woods. With me there is a peculiar emotional tone that goes with thoughts of travel."

8. M., 30. "The novelty of seeing new things and having new experiences are the attractions of travel. I sometimes get tired of habitual surroundings—I think from the monotony and sameness of repeated experiences."

9. F., 16. "A day's walk through the woods has the greatest charm for me. The freedom, the wildness, the quietness, the birds, flowers, all answering to an inner feeling of joyousness; a feeling of being *at home* with nature."

10. F., 20. "The new sights. I like, too, the onward motion, the feeling that I am going."

11. F., 19. "I think I never had a desire to run away, but sometimes in spring I have had desire to go for a walk by myself; I have gone to walk through the fields and woods. It seems as though I wished to enjoy it alone and not speak to any one."

12. M., 20. "In my experience the bicycle has held the most interest in the charms of travel. It is akin to flying, the swift motion and delightful breezes fanning your head are pleasant sensations."

The thirst for travel is a product of a nexus of factors. In our 280 returns, however, two groups of motives have dominated. First they show that travelling is a favorite means to destroy monotony, it breaks up the tedium of the hour; it shelves old experiences and sensations, that have induced a sort of mental cramp or fatigue. Travelling relieves this cramp by furnishing a superior sort of new psychical and bodily activities; second, they indicate strongly that the desire to experience sensations of motion is unique among human passions. Josiah Flynt says: "The possibility of

riding everywhere afforded by our net work of railways is alluring to the boy and often wins many to trampdom." Shaler thinks the love of adventure (chart IV) can best be satisfied by going to sea.

The sensation of motion, as yet but little studied from a pleasure-pain standpoint, is undoubtedly a pleasure giving sensation. For Aristippus the end of life is pleasure which he defines as gentle motion. Motherhood long ago discovered its virtue as furnished by the cradle. Galloping to town on the parental knee is a pleasing pastime in every nursery. The several varieties of swings, the hammock, see-saw, flying-jenny, merry-go-round, shooting-the-chute, sailing, coasting, rowing and skating, together with the fondness<sup>1</sup> of children for rotating rapidly in one spot until dizzy, and for jumping from high places, are all devices and sports to stimulate the sense of motion. In most of these modes of motion the body is passive or semi-passive, save in such motions as skating and rotating on the feet. The passiveness of the body precludes any important contribution of stimuli from kinaesthetic sources. The stimuli are probably furnished, as Dr. Hall and others have suggested, by a redistribution of fluid-pressures (due to the unusual motions and positions of the body) to the inner walls of the several vascular systems of the body.

Love of adventure (see table III chart IV) is apparently prompted by a variety of motives, *e. g.*, by rebellion against restraint, love of freedom, of travel, thirst for knowledge, chivalry; and also by the dare-devil, iconoclastic spirit that revels in the unexpected and courts fortune through the factors of lottery and chance.

Rubrics I, II, concerning runaways, and IX and XI, pertaining to homesickness, etc., are treated in a comparative way (table IV) as interesting from a sociological standpoint and as a further introduction to the material of section C.

Probably the most general and fundamental group of facts are those pertaining to the home and parents. The percentage of orphans in both lovers of home and runaways are comparatively small.

Tenantry is much more common among parents of runaways — 35% as against 18% for lovers of home. The conditions of the home are classified into poor, moderate, comfortable and bountiful. The largest number of homes in both groups belong to the comfortable class. An examination of all the classes shows that the runaways bear by far the greatest number of inferior homes in an economic sense.

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<sup>1</sup> Hall, G. Stanley: Study of Fears: *Am. Jour. Psy.*, Vol. VIII, No. 2, p. 157.

Nineteen per cent. of the runaways come from poor homes as opposed to no per cent. of home lovers. It is unnecessary to comment on the rest of the items compared—the table is self-explanatory.

TABLE IV.

*Showing the comparative sociological conditions, traits, etc., of five hundred (500) runaways and two hundred and twenty-five (225) lovers of home (ages 1-20 years).*

RUNAWAYS.		Per cent.	LOVERS OF HOME.		Per cent.
Parents.	Both living	86	.	.	80
	Partially orphans	11	.	.	16
	Wholly orphans	3	.	.	3
Do not own their homes		35	.	.	18
Conditions of home.	Poor	19	.	.	0
	Moderate	30	.	.	6
	Comfortable	40	.	.	58
	Bountiful	11	.	.	23
Not affectionate		45	.	.	9
Physically defective		12	.	.	0
Numerical relation in the family.	Oldest	23	.	.	20
	Youngest	25	.	.	32
	Only	23	.	.	2
	Neither	28	.	.	45
Sensitive		62	.	.	90
Demonstrative		60	.	.	32
Laugh easily		70	.	.	79
Cry easily		62	.	.	73
Generous		74	.	.	87
Careless in dress		52	.	.	10
Like crowds		79	.	.	36
Shun crowds		21	.	.	64
Careful of property		61	.	.	90
Regards others rights		64	.	.	93
Made no collection		45	.	.	12
Persistent in tasks		74	.	.	85

## SUMMARY.

The discussion of migration of animals indicates that the most general initiative factor that disturbs the psycho-physiological adjustments is the procreative function, but that the mode and time of its operation is greatly modified by cosmic forces.

We do not trace with equal certainty the operation of the same factors in the same order and effectiveness in originating and controlling the instinct in man for the obvious reasons that he has freed himself to a great extent from these archaic forces and in a measure controls them; besides he has set up a *social cosmos*, as it were, of his own that must be obeyed. Despite these hindrances, however, we do get traces here and there of the persistency and effectiveness of *the inner, the cosmic* and the *social* forces involved in the differentiation

of the instinct. The movements of primitive man were controlled, in all probability, by the distribution of certain foods, by the physical geography of the country, and by the change of seasons. The factors of climatology together with the topography of the country have greatly controlled, if not actually touched off, the instinct as seen in historic migrations.

The passions for local roving, "gadding about," frequent moving and gypsying is a reassertion of the old psychoses that was formed when to know friend and foe were essential to self-preservation, and when the highest conditions of lot and chance were assiduously courted. Spring fever, ennui, psycho-physiological disturbances of spring, and of the lunar as well as certain solar periods, then, too, the vernal increase in the number of marriages and in the number of illegitimate births; the strengthening of the love of adventure, for independence and freedom at the onset of puberty; the greatest number of runaway adolescents occurring in the spring — all alike point to the general conclusion that the procreative functions and their irradiations and cosmic periodicities are joint factors in the differentiation of the migratory instinct. They are the factors that have ever periodically disturbed whatever adjustment that man may have effected with his environment on a vegetative basis.

Finally, the migratory instinct is general, if not universal. It is merely a matter of degree — sometimes very slight, too — from the mental throes, perturbations and secret threats of leaving home by the adolescent to their actual occurrence. The gradual passage from the adolescent who fights and smothers these several subjective upheavals and remains at home, or from the one who subdues the desire for change and continually adjusts himself to present tasks to the one who is overcome and breaks away is paralleled by the fine shades from sanity to insanity, or from the feint inner thoughts of to the actual committing of crime.<sup>1</sup>

We are not then dealing with anomalous elements and characters. The germs and even at times the full fruition are in us all, partly as a heritage and partly acquired. (See cases 1 and 2.)

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<sup>1</sup> Ferri, E.: *Criminal Sociology*, p. 43 — "Every man, however pure and honest he may be, is conscious now and then of a transitory notion of some dishonest or criminal action. But with the honest man, exactly because he is physically and morally normal, this notion of crime which simultaneously summons up the idea of its grievous consequences, glances off the surface of the moral conscience . . . with the man who is less normal and has less forethought, the notion dwells and finally prevails."

## SECTION C.

## LOVE OF HOME.

The love of home is indeed an archaic theme in literature. An activity of the soul that arose very probably soon after the sex broad-ax dichotomized organic life. To build a home, furnish and protect it absorb the quintessence of the energies of the greater part of living species<sup>1</sup>. The instinct is expressed oftentimes in an unmistakable manner by the unnatural and waning activities of wild animals in captivity longing to return to their familiar haunts.

Werworn<sup>2</sup> found that many lowly forms of pelagic life, although under the very best conditions, decrease considerably in volume in a few days, many die within less than a week. He kept beroës alive three weeks. One beroë that measured 2 cm. long, after 14 days captivity was only 6 mm. long.

<sup>3</sup>Young shows that in vessels of the same shape the larger the area of the vessels, the greater the growth of tadpoles confined therein. <sup>4</sup>De Varigny has found the same to be true of the pond snail. He interprets this dwarfing as a physiological or mechanical *impedimenta* to movements, *i. e.*, he would make free exercise one of the functions of growth. Darwin observes that insular animals are smaller than their continental congeners. For instance, in the Canary Islands the oxen of one of the smallest islands are much smaller than those of the others, although all belong to the same breed; the same is true of their horses. Spencer says "It is well known by all anglers that trout and other fishes are small in small streams and large in larger rivers."

According to Bates, only one of the largest species of the South American turtles will live long in captivity, the smaller ones die in a few days. Snapping turtles generally refuse food and remain shy and fierce, but taken young can be brought to feed. Sea snakes cannot be kept alive many days even in salt water. The vipers all vomit their food after being taken captives and will seldom take any further nourishment except water. <sup>5</sup>Jordan found that female newts kept in confinement all winter were not so apt to lay eggs in the spring as those freshly captured. The

<sup>1</sup> The agricultural achievements of the ant common in several lands, the variety of architectural designs for the home and the certainty and cleverness of their execution as seen in the life history of ants, bees, fish, birds and both lower and higher mammals, furnish abundant examples of the large bulk of animal activities exerted for the realization of a and its belongings.

<sup>2</sup> Werworn: *Plfüg. Archiv.*, Vol. L, 1891, pp. 439-440.

<sup>3</sup> Young: *Arch. des Sci. Phys. et Nat.*, Vol. XIV, 1885.

<sup>4</sup> De Varigny: *Experimental Evolution*.

<sup>5</sup> Jordan: *Habits and Developments of Newts*, *Jour. Morphology*, Vol. VIII, pp. 269-366.

duckbill<sup>1</sup> and pouched mole in spite of all care and attention live but a very short time in captivity. Hartmann, Chaillou and others give several instances of young monkeys dying soon after capture. Captured adult pumas<sup>2</sup> invariably pine away and die. Delboeuf<sup>3</sup> allowed two different species of lizards to run together in his laboratory for over two years. One disappeared suddenly for three weeks, during which time the second one refused all food, and had no relish for insects and earthworms until the absent one returned. A species of snake (*pelias berus*) usually refuses all food ; but if the floor of its cage is made to look like its native moor it will sometimes feed voluntarily. Cornish<sup>4</sup> says nearly all animals dislike solitude and confinement. Tame hawks and falcons, if kept alone in a room mope and lose condition, and in some species a suicidal instinct is developed. Merlins kept in solitary confinement destroy their claws and toes.

These citations, though by no means exhaustive, illustrate that not only forcible curtailing or limiting conditions for exercise, but a sudden change of environment, feeding grounds or even loss of companionship will cause dwarfing, sickness and even death to wild animals.

Instances<sup>5</sup> of the love for home among domestic animals and their intense mental sufferings when away per force were given in Section A.

Some of the factors making for the *love of home* in man are set forth in the cases below.<sup>6</sup>

1. F., 19. "I think that the order is mother first, father and brother equally. I like to think of my surroundings, at home in this order, the sitting-room, the two maples in the yard, the brook and the surrounding hills."

2. F., 20. "The elements in my own love of home are first my father, then sister, brothers, the house, and familiar spots on the farm."

3. F., 17. "... Father and mother and next my sister and brother—then the home feeling which I have but which I cannot possibly explain."

The family as a whole or the member in the manner given in these three cases, of course, take precedence over all other elements in all the returns, therefore, they are omitted in the rest of the cases.

4. F., 25. Scenery and past association.

5. F., 20. House, water, hills, trees, familiar ways of life.

6. F., —. House, natural scenery, familiar ways of life.

<sup>1</sup> Bennett, G.: *Gatherings of a Naturalist in Australasia*, 1860.

<sup>2</sup> Hudson: *The Naturalist in La Plata*, p. 44.

<sup>3</sup> Delboeuf, J.: *Pop. Sci. Month.*, Vol. L, pp. 395-99, 1897.

<sup>4</sup> Cornish, C. J.: *Animals at Work and Play*, '96, pp. 31-38.

<sup>5</sup> Selected at random from 200 answers to Rubric XIII of Syllabus.

<sup>6</sup> Selected at random from 160 answers to Rubric X of Syllabus.

7. F., —. Friends, location and familiar scenes.
8. F., 18. House, hills, and mode of living.
9. F., 25. Natural scenery and associations connected with it.
10. M., 19. Of my father, mother, brother, it would be hard to tell which I love most. They are all a part in my life. But of the house and surroundings, hills and valleys, there is that lasting feeling which ties me to it.
11. F., 21. Hill, trees, and natural scenery around my own home seem dearer to me than those of any other place.
12. M., 25. Familiar ways of life, all the familiar parts of the house; its nooks and crannies, where old associations and memories cluster thick as swarming bees; the plot of ground about the house, and lastly the outlook from its doors and windows, such as hills, trees, lawns, etc.
13. F., 22. The room where we sit together evenings, my own room, my bird and other household pets, the scenery, especially the mountains.
14. M., 22. House itself, trees that stand before it, a hill back of it.
15. F., 26. Familiar books and furniture, and the sincerity and naturalness of home relations.
16. M., 27. Habit I think enters strongly into my love of home—accustomed faces, furniture, surroundings, etc.
17. M., 30. Familiar haunts, chance to relax and feel easy.
18. F., 21. Distant hills, domestic animals and pets, home habits and family ways.
19. F., 22. The house itself because I was born there—then the woods and fields, which abound in nooks so pleasant to me, familiar ways of the people about the town.
20. F., 18. Naturalness of home life, the cozy surroundings, trees, flowers, the peaceful river and sceneries, the sociability of friends.
21. F., 18. Ways of the home, everything seems familiar, the good times we all have together, freedom of the home, always open to my friends and all friends of the family.

Ninety per cent. of the cases are females. By far the great majority (62%) rank mother first, father second (30%). Some (3.7%) say that the members of the family do not separate out into individual preferences. They regard the family, as a whole, the strongest factor. Two per cent. rank parents first, followed by other members of the family. A very few (1%) think a brother or sister is first choice. Females have more preferences among members of the household, or, at least, hesitate less to undertake an analysis.

After members of the family the most common element is the *natural scenery* about the home (85%). This<sup>1</sup> consists of garden, lawn, familiar spots on the farm, trees, grove, river, brook, lakes, water falls, hills, distant mountains. Then, too, sunrise and sunset—on the prairie, or on the mountain, or from my window. The *house itself* (70%). Because I was born there—always been my home, its cozy rooms, especially my room, all my things are there. *Familiar ways* (65%),

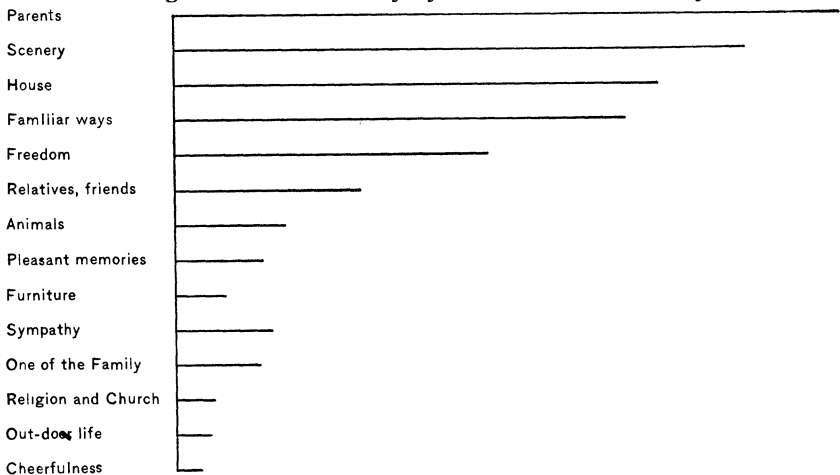
<sup>1</sup> Per cents are estimated on the number of times the factors are mentioned.



the sincerity and naturalness of home life, the home "feeling," quiet way and way we do it, time for meals, table manners, evening chats. *Freedom of the home* (43%), place to relax and feel easy, absence of restraint by strangers, freedom to talk without fear of offending, to go where and when I please, free use of all the house. *Relatives and friends* (25%), genial ways, interested in me, good times together. The relative strength of these several elements is illustrated diagrammatically in Diagram II. One is surprised at finding sympathy so low among the elements enumerated. Phrases like the following occur: Sympathy for my work; for my troubles; for my inclination; for my plans.

DIAGRAM II.

*Showing the relative values of a few elements in the love of home.*



The love of home, it appears, is a complex of at least three general groups of factors: first, the personnel of the family; second, the variety of home life, both as to activities and material objects, especially objects in nature; third, the relation of the first two groups to self. If this relation is one in which the self-regarding interests have been administered to, the intensity of home love is usually a strong one.

It is noteworthy that those whose home affections are exclusively for members of the family, were the children of parents that moved frequently, or lived in tenement flats, and thus were robbed of the associations of trees, hills, mountains, lakes, and so on. The following cases are typical:

22. F., 25. "My love of home is almost entirely personal, as we live in New York city flats."

23. F., 21. "I love my home because it is the place where my

mother and father live. The hills do not especially strike my sense of the beautiful or the picturesque, as they only vary from about four inches to one foot in height. We have one tree in our yard, and it would not take very long to count the leaves on it. The natural scenery consists of rows of brick houses."

24. F., —. "My love of home is very strong, but I don't know that I can specify the elements in it. I think it cannot be the house or natural scenery, for until I was about grown I had never lived more than a year or two at the same place (being an itinerant preacher's daughter). I grew up with the feeling that wherever papa and mamma were was home."

25. F., 33. "I have known three homes. All handsome. In two of them my position was that of sister, in the third, wife. I find that the sense of home exists only with the sense of *personal possession* and *responsibility*, and *congenial ways of life*."

Some factors lying apparently at the basis of the affections for home are emphasized by answers to Rubric IX. Eighty per cent. of the cases (104) are females.

26. F., 20. "Always hated to stay away from home, feeling that something might happen to my people, or that my mother might die before my return."

27. F., 18. Until within a few years past never objected to be away from home. Lost her father at 12, and since then will only very reluctantly leave her mother over night.

28. F., 15. Would never go out to parties or out with other girls. At her mother's wish she packed her trunk and made ready to spend a summer vacation in the country. She started several times, broke out crying each time, and finally gave it up.

29. F., 22. Gets homesick away over night even with her sister.

30. M., 38. Very systematic in habits, does everything by clock-work. Sociable and full of fun, but never goes away from home even for a night. Has been in the same office for 20 years. As a boy did not care to gad about the streets.

31. "Common thing for people of middle life to say it is an effort for them to get away from home, and that they can sleep better in their own beds. Know a lady of 25 who never likes to go on a vacation. A week away seems very long, . . . is not happy or at ease until in her home again."

32. M., 30. Very conscientious, an indefatigable worker, could never rest away from home *unless* his family were with him. Wants but a few friends.

33. M., 64. Does not like to be with crowds, never stayed away from home many nights in his life, dislikes to get out sight of the house.

34. F., 17. A regular home girl, good housekeeper and manager. Dislikes to meet strangers. When 12 or 13 would go occasionally to spend the night with a cousin, but scarcely found sleep. She seemed to be attacked with all the horrors of homesickness, would cry nearly all night. Afraid that mother might die that night.

35. F., 55. Married and lived on a farm, no family. She and her husband very often do not speak for weeks. She is fond of company, but never leaves home except to go to the market. She is very ambitious to make money. I think that is why she stays at home so closely. She is afraid to leave home lest something might go to ruin.

36. F., 88. Has, and always has had the intensest love for her little wee shabby home. She cannot bear to be away from it a moment just for sheer love of it. Just as a loving mother cannot bear to leave her

little baby. She cares for it in a way that is almost caressing in its fondness and prettiness. She permits no one to do a thing for her. She cleans it, scrubs it, and keeps it dainty with the utmost joy. I know from things she has said to me that it would pain her to have any of her dearly beloved house utensils carelessly used or handled. She once gave me a pretty piece of old-fashioned ware because she said that her grandchildren would be likely to break it if it was left to them, and she did not like to think of it ever being broken.

Last summer (her 88th year) she made her own garden, planted and hoed it. She had it plowed, but that was all. She could not bear to have any one touch it but herself. Her two sons, who live near by, would gladly do everything for her. Whenever I go there she takes me all over the little baby house, down cellar, into the woodshed, the pantry, shows me her cistern, her dishes and everything, just as we used to show off our playhouses when children. She is a woman of exquisite, native refinement; her thoughts are all very poetic and lovely thoughts.

Section B (Table IV) calls attention to the home life of home lovers as usually congenial and quite comfortable in a material way. Their lives are industrious, quiet, uneventful, conservative. <sup>1</sup>Guppy says: "It was the boast of a wealthy old Devonshire yeoman, 150 years ago, that he had never crossed the borders of his native country, and I cannot believe that in this respect he differed greatly from his fellows. . . . This gave solidity of character to which the long persistence of families in the same locality and in the same stations is mainly due." They love order, fond of systematic work, and believe that there is a virtue in doing things at fixed times. Some spend life happily in one place tinkering and puttering away at odd jobs. Cases 50, 54, 55 and 56, represent a large class that make few friends, retiring in disposition; dread meeting strangers, entering a new place, or even sleeping in a strange bed; are in constant dread when among strangers either of *boring* some one or getting *bored*. They have more fears than rovers and gad-about. Although they shun crowds, hospitality and open friendship are found at their homes. Many are fond of company, and delight in the duties of hostess.

Habit, born of necessity, doubtless explains much of the phenomena. Some are suddenly and almost pitifully attached to their homes through some shock occasioned by a death in the family (case 48), or by sickness contracted away from, or by some other unexpected misfortune. They come to feel that to leave home will in some mysterious way precipitate a dire calamity. This feeling and nervousness often becomes so intense at leaving that the journey is abandoned. Thus sorrow and disappointment may greatly intensify the home feeling. The dread of meeting persons, shunning the effort to bear up the "dead weight" of the presence of strangers, the fear

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<sup>1</sup>Guppy, H. B.: The Homes of Family Names.

of not being welcome, of injuring some one's feelings indicate, at least, a strong coincidence between the fear of persons and the love of home. Dr. Hall<sup>1</sup> finds that the fear of persons ranks third, exceeded only by the fear of thunder storms and reptiles.

They may grow homesick or timid or their resolution to stay away may break down at the approach of night. They are afraid "mother might die" (case 56); something "at home might go to ruin" (case 57); "something fatally done" (case 45), or that they will never see home again, that they themselves may die that night. One after returning home examines every shrub and flower in the yard to see if they are unharmed (case 34), another goes straight to her room to see if all her things are as she had left them, and so on. May not this unusual unrest and anxiety about home and its belongings be a remnant of the bitter and costly experience that man along with so many other species must have suffered through the neglect of properly guarding or hiding the home.

Many species of life must have had some such experience, otherwise the origin of the widespread instinct to post sentinels or place some obstacle in the way of approach to the home is still unsolvable.<sup>2</sup> The home of whatever species, being the center of family possessions has always been the one tempting object for attack and pillage. Even civilization like modern frontier life is not without its lessons of wrecked homes in the absence of its natural protectors. It would be a wonder if these bitter experiences during the evolution of the home from the ill-provised tent of the nomad to the modern brown front had left no trace upon the soul.

The feeling of comfort and ease based on habit,<sup>3</sup> familiarity and freedom is nowhere fostered as in the home. The feeling that our ways are better ways, the difficulty to adopt one's self to other ways of life than those learned in childhood are just so much data on the general laws of habit. It weds every one of us to the manners, nooks and crannies, hills, valleys, lakes and forests of our own home and neighborhood. The sense of familiarity so frequently mentioned is but a function of habit. We like the feel of things, welcome under all circumstances, the "warmth and intimacy," the naturalness of home relations. What is this naturalness but a maximum reduction of friction through habit? Along with familiarity runs a deeper

<sup>1</sup> Hall, G. Stanley: *Amer. Jour. Psy.*, Vol. VIII, No. 2, 1897.

<sup>2</sup> Ants, bees, species of fish like the stickle back, species of birds, monotremes, prairie dogs, many herbivorous and several species of monkeys post sentinels to give the danger signal or do battle for the home when attacked by the enemy.

<sup>3</sup> James, William: *Psychology*, Vol. I.

feeling, that of freedom. At home I can do what I like, have a chance to relax and feel easy, and throw off conventional restraint.

The fact that natural scenery ranks next to members of the family as a factor in the love of home justifies further investigation—far more than this paper contemplates.

There is little doubt now but that “gods<sup>1</sup> of the early world are the rocks and the mountains, the trees, the rivers, the sea.” The primitive mind did not even distinguish animate from inanimate objects, but both alike possessed life, passions and spirits. Along with this belief in the general animation of everything went the belief in metamorphosis. Their gods were creative. “In Greece<sup>2</sup> the stories of the descent of man from gods stand side by side with ancient legends of men sprung from trees or rocks, or of races whose mother was a tree and their father a god. Similar myths, connecting both men and gods with animals, plants and rocks, are found all over the world and were not lacking among the Semites.” In addition to being objects of worship, trees, rivers and mountains have always been favorite places for worship. The word kirk, now softened into church from quercus oak, indicates early religious use of trees. Preferences for certain waters in rituals is evidenced by Naaman’s indignation when he was told to bathe in the Jordan instead of the rivers of Damascus. Again we read : “The hour cometh when ye shall neither worship in this mountain . . . .”

The application of flowers and plants to ceremonial purposes is of the highest antiquity. Of forests Coulter<sup>3</sup> says : “There is solemnity about them, a quiet grandeur, which is very impressive, and the rustling of their branches and leaves has that mysterious sound which caused the ancients to people them with spirits. We still recognize the feeling of awe that comes in the presence of forests.” Rivers and springs, trees and plants have long administered to the ills of man. The mountains have furnished him shelter from storms and enemies. The feeling of the child and adolescent for stream and forest has already been indicated. Truly, the race has lost none of its attachment for these archaic friends.

The love of home viewed from the standpoint of nostalgia adds emphasis to matter already presented and gives renewed interest to somewhat old psychological problems. Some typical cases of nostalgia are presented, taken from 176 reports on that topic. Six per cent. of the members report as having never been homesick. Eighty-seven per cent. are females. This

<sup>1</sup> Fergusson : *Tree and Serpent Worship*, p. 54.

<sup>2</sup> Smith, W. Robertson : *The Religion of the Semites*, p. 86.

<sup>3</sup> Coulter, J. M. : *Nature and Art*, Vol. I, p. 1, 1898.

large percentage I think is due to the fact that eighty-six per cent. of those that answered the syllabus were females. No sharp line can be drawn between loneliness and homesickness. The latter is oftentimes preceded by a brief period of the former.

1. M., 4. Whose parents had moved to a new neighborhood, said even before the house furniture had been put in order, "Let's take the cows and go back home."

2. M., 5. Became very lonely and homesick to return to the old home from which parents had just moved. When questioned why he wished to return, said, "I want to get my playthings." They consisted of a stick horse, a few pebbles and broken dishes.

3. F., 21. "When I first entered school I was homesick for several weeks. If lessons were hard and I found much difficulty in mastering them, I would get a longing for home that would not leave me until after a night's sleep."

4. F., 19. "Have never experienced intense feelings of homesickness, although I have longed to be at home at times when dissatisfied with my surroundings or my work. The feeling wore off with increased interest in my work."

5. F., 20. Experienced homesickness only for a short time and then it was mostly due to lack of employment.

6. M., 5. Went to stay all night with a neighbor only a few rods away from home. Became so homesick that he had to be carried home even in the night.

7. F. "At about eight visited an aunt. At night I would cry myself to sleep thinking of the pleasant ways at home. I felt forsaken and forgotten, worried about accidents that might happen at home. I was afraid some one would die before getting home."

8. M., 21. "At 10 went to spend the night away from home for the first time. Made it all right during the day. At night was seized with a tremendous longing to be at home. I was helping to shell peas, put one in my mouth but could not swallow, I felt so badly. Without saying a word put on my hat and walked home two miles in the dark."

9. M., 19. "Could not eat, whenever I would try I would choke up. Felt sick all over. Did not want to say anything—was thinking of home all the time—could not think of anything else. There was sort of a smarting sensation in my stomach, and I *felt faint*."

10. F., 18. (First term in boarding school.) "I *felt dazed* and for a long time I could not realize why I was where I was."

11. M., 24. "I cried every day for three weeks about sundown. I could not tell why I cried, for I had been very anxious to go away to boarding school and would not have gone home had I had the opportunity."

12. F., 10. "I used always to get homesick if separated from my mother; but if she left me at home, it was not so bad as when I left home—suppose the familiarity of home surroundings lessened the sickness."

13. F., 22. "At 12 while in school became homesick and finally ill. The physician said there could be no marked improvement while I remained from home, as that was my one thought. I had not been home but a few hours when I ate a hearty meal and slept well, and in one week was well again, while the day I came home I had to be carried up stairs."

14. "All new girls at this school were placed in the back part of the hall, which was dark and gloomy. Looking out of my window I

could see any number of tin roofs, chimneys, back-yards, and servants passing in and out. These sights together with the coldness of the older students made me dreadfully homesick."

15. F., 22. At seven stayed away from home a week, could not eat anything and was always looking to see some house or scenery that *looked like home*.

16. F., 10. Was sent away to a school for girls—she was eager to go. Enjoyed the change at first but soon gave way to extreme homesickness. At the end of three months of school life she had become really ill—was very thin, ate almost nothing, had a heavy cough and was believed to have consumption. She was sent home and recovered in a few days.

17. F., 18. "Got along well during the day, but at nightfall would choke up and when the crickets, the "Katydid" (cicadae) and the low wind began to make a noise I broke down and cried myself to sleep."

18. "I was homesick once, at home, too,—(father and mother had gone away for some time). I was all alone in the old house. The feeling was similar to *nausea* only in a less degree with such a longing for some one to come."

19. F., 18. "I lost my appetite, could not be comforted, did not wish to talk, would get *dizzy* when I walked across the floor."

20. F., 23. "Do not lose my ambition to work but feel doleful, lose my appetite, so that I almost come down sick. Have a bad feeling all the time in the region of my stomach which ceases with the homesickness. I think homesickness is the most appalling thing under the sun. It swoops down on one before one knows it and you cannot get rid of it." ‡

21. F., 17. "An indescribable longing. I seemed sick all inside myself and all choked up."

22. F., 18. "I would always get sick at my stomach and often vomit. My family would laugh at me when I reached home and say it was homesickness. There is a feeling of pain, as well as I can locate, a little lower than my heart."

23. F., 30. "I always have a smothering sensation—everything seems closing in on me."

24. M., 22. "I feel melancholy, down hearted. There seems to be a lump in my throat—I feel that a good cry would help."

25. M., 23. "I lost both appetite and weight, had to give up work and go home."

26. F., 25. "My dreams of home make me homesick."

27. F., 18. "I felt unloved and unloving to all around me and could only conceive of happiness at home."

AGE. Forty-three per cent. of these cases (166) occurred for the first time at ages 16, 17 and 18 years. Eighty per cent. occurred for the first time from ages 12 to and including 18 years. The large number occurring at 16, 17 and 18 is due to the fact that conditions for homesickness were presented for the first time at these ages, *e. g.*, entering school or college, taking a new position, entering the navy or army.

Hack Tuke<sup>1</sup> thinks there are no general rules for its occurrence in the different sexes, ages and temperament. Papillon<sup>2</sup> says: "Nostalgia attacks by preferences, young people and

<sup>1</sup>Tuke, Hack: Dic. of Psy. Medicine, Vol. II, p. 858.

<sup>2</sup>Papillon, Fernaud: Pop. Sci. Month., Vol. V, pp. 215-20, 1874.

those just entering youth, affecting all temperaments without distinction."

"Adolescence is really the age for predilection to nostalgia," says Widal,<sup>1</sup> "It is the age of delusion and of love. The young man is still under the influence of his childish memories which dispose him to recall the place where he has been happy and to magnify the charms of native land as soon as he encounters the first deception of life." An army<sup>2</sup> surgeon writing on the evils of youthful enlistment, and nostalgia says: "Among young prisoners of war it is the most complicated disease to be encountered." Both the French and German army surgeons confirm this view; and all agree that fresh *youthful* troops from *rural* districts are often a positive hindrance to the efficiency of an army because of their predilection to homesickness. Widal believes that there are vague signs of it in babyhood. "Although this affection may be incompatible with the infant, it is none the less true that, instinctively the nursing child is affected by all that surrounds it, and the tears which it sheds when one changes its food or removes its rattle are already vague feelings of nostalgia." My impression, based on medical literature and other material, is that in quality or intensity (cases 9, 25) nostalgia is just as severe and if allowed will lead to as fatal results before and after as those cases occurring in adolescence but that the latter is more predisposed to an attack than either childhood or manhood.

SEX. Tuke thinks no rules can be laid down regarding its relations to sex. Widal thinks woman is less subject to nostalgia than man because she can enter into new conditions and receive new influences without herself suffering any great change. This notion squares with the general theory that she is more conservative than man. "Whatever may be the migration of woman her manner of life is less changed and like the ancient wanderers she carries her household gods with her." These are the reflections of a French army surgeon who had studied nostalgia in camp, prisons and hospitals, all three presenting the pink of conditions for the ravages of the disease. Had he been a physician to a cotton or woolen factory, a female boarding school, or a modern normal school, it is probable that his notions would have been considerably modified.

While the present study (eighty-seven per cent. females) indicates that women are more liable to the sickness, I hesitate

<sup>1</sup> V. Widal: Dic. Eng. des Sci. Medicales, pp. 357-380.

<sup>2</sup> Peters, DeWitt C. (U. S. A. Surgeon): Am. Med. Times, Vol. VI, 1863.



in the absence of a wider range of data to draw any conclusions on this point.

*Temperament and Nationality.* It is generally agreed that the most diverse temperaments pay equal tribute to nostalgia, so that an attempt to make any classification on that basis is of no value. I find, however, that the majority of the cases are sensitive, not a few nervous, timid, sociable, affectionate; but they fear a crowd, dread meeting strangers, delight in the simplicity and shelter of domestic life. Another class occurring often enough to mention is the phlegmatic, the taciturn. They are described as "difficult to entertain," "prefer to be by themselves," "interests are odd or provincial." They move in a self-created world. With but few exceptions the cases are Americans of Anglo-Saxon stock. A few pitiful cases of foreigners unable to speak our language are reported.

A French writer says: "That every one imagines that his native soil is distinguished from others by signal favors, by particular and rare attributes, and that nature has need of this illusion in order to keep each man in his own home." Widal thinks that the predilection to nostalgia is inversely to the degree of civilization of a people. Sagos, quoted by <sup>1</sup>Papillon, says "that love of country is strongest with those who are nearest to a state of nature." Savages living under the rudest forms of civilization, in the most uninviting climates, grieve when they quit them. A Lapp brought to Poland where every kindness was shown him, was seized with incurable sadness, and at last escaped and returned to his inhospitable country. Greenlanders taken across to Denmark risk certain death by trusting themselves to slight canoes to cross the ocean separating them from their own land. Pocahontas, fondled and caressed by London society, grew homesick for Virginia's woods and finally wasted and pined away. The Psalmist<sup>2</sup> records Israel's yearning for their Judean homes while captives in Babylon. "By the rivers of Babylon, there we sat down, yea we wept, when we remembered Zion. We hanged our harps upon the willows in the midst thereof. . . . How shall we sing the Lord's song in a strange land?"

*Nationality.* Switzerland is the classic land of nostalgia. The love of freedom and independence of the inhabitants, their love of family life, the pure air of the mountains, the charming scenery of which the accentuated outlines become etched into their very souls are all elements that make for love of home. Next come the French. The disposition to the disease diminishes roughly in proportion as one advances toward the middle of the country<sup>3</sup> (France).

<sup>1</sup> Papillon, Fernaud: *loc. cit.*, p. 218.

<sup>2</sup> Psalm CXXXVII, Verses, 1, 2, 4.

<sup>3</sup> Based upon thousands of cases in French military hospitals.

English and Germans leave their country with less reluctance than the citizens of other countries. More cases occur among German troops in foreign lands than among the English, whose adventurous and cosmopolitan spirit (his country is wherever his flag floats), his commercial predilection immune him from nostalgia without removing in the least his attachment for his country.

Dr. Peters<sup>1</sup> describing the ravages of homesickness among fresh troops quartered in New Orleans (1862), says: "This was notably true of soldiers from New England, where it appeared that the love for home was very strong."

Dr. Calhoun<sup>2</sup> writes: "It is a matter of common remark in this army that troops from the country have a much larger percentage of deaths than those recruited in the cities." He thinks that the peculiar susceptibility to nostalgia of those from rural districts is due to the fact that a country boy is more at home, seldom takes his meals at other than the family table, seldom sleeps away from home, has less temptation to leave it, and thinks more of it and its influences than he who in the city spends his days in the workshop or counting-room, and his nights at the thousand and one places of amusement a city affords; then, too, the city boy gets his meals at the restaurant or the boarding-house.

*Facilitating Conditions.* By these I mean the variety of conditions in which nostalgia occurs and the factors that may aggravate it. Fifty per cent. of the cases reported occurred on entering school—even the first day of school. Others occurred while making a visit in the country from the city, or *vice versa*, or in beginning the first school, taking a new position among strangers, moving to a new neighborhood, to a foreign land, being left alone at home, taken sick away from home; again seeing or meeting some one from home, or even receiving a letter, is sufficient at times to touch off the pent-up feelings.

Idleness, the mother of a motley host of delinquent offspring, is exceedingly prolific in this disease (case 5). Among soldiers<sup>3</sup> and sailors, idleness, coupled with suspense and lim-

<sup>1</sup> Dr. Peters: *loc. cit.*, pp. 75-6.

<sup>2</sup> Calhoun, Th. J.: Nostalgia as a disease of field service. *Medical and Surgical Reporter*, Vol. XI, p. 131, Phil., 1864.

<sup>3</sup> In military life the beginning and the close of service is marked by increased nostalgia. "When I took charge of the division they were losing men by death daily. That it was not due to local causes was proved by the fact that adjoining regiments exposed to the same local influences, lost none, and of the patients at our division hospital, with the same diseases (typho-malarial fever and camp dysentery), those from the 120th N. Y., Vols. died under the same treatment that the others got well on. The regiment is from one of the river counties

ited freedom, is more than the ordinary soul can endure with equanimity. It wrings the cold sweat from the stoutest.

According to my returns nightfall exceeds all other elements in aggravating and intensifying the sickness. (Cases 12, 16, 18, 23, 35.) The stillness of the night, the chirping of crickets, the whispering of the leaves, the sough of the wind, new and strange noises, real or imagined, all intensify the gloom and forsakenness of the unfortunate. Dr. Hall's<sup>1</sup> study of Fears emphasizes the wonderful horrors that night holds in store for so many, even though surrounded by every comfort and protection. Less frequent aggravations are the reception of letters and articles from home; dreams about home; the feeling of goneness on facing the real after awakening; friends offering sympathy; hearing a familiar song. So strong and disturbing was the influences of a certain air on Swiss soldiers in the service of the French that it was forbidden to be played in their hearing.

*Psychical Effects.* It usually begins by feeling lonely, desolate, forsaken. "Longing for a lost past," "low spirited," "loss of ambition," "hard to cheer up," "no interest in surroundings." Desire to please, natural coquetry and regard for the opposite sex disappear. Some report: "I wanted to cry;" "wanted to scream;" "cried most all the time;" "cried myself to sleep;" "could think of nothing but home;" "thought all the time on objects at home;" "felt as if I would go insane." Sometimes it comes very suddenly. "It swooped down on me;" "felt as though everything was closing in on me;" "there is a smothering sensation;" "feeling of utter despair came over me all at once." They may become iconoclastic. "Wanted to destroy everything in my way;" "had no mercy on man nor beast until I reached home." In its last stages hallucinations and delirium set in, followed by complete prostration, stupor, syncope and death.

*Bodily Phenomena.* The three most general, if not universal effects, are (1) loss of appetite, (2) gastro-enteric troubles, (3) irregularity in respiration interrupted by sighing. Vague, erratic pains—variable in intensity—accompany all the symptoms, and become more and more localized in the head and stomach. Vomiting often begins early (case 31), the same is true of animals—the eyes become more and more fixed, dull,

of New York state. Nearly all who died were farmers. Those who were sent on furlough got well, while those who remained died. But a still further proof is present. The battle of Chancellorsville cured the regiment, and it has since enjoyed as good health as any in the division. This leads me to the remark, that *BATTLE is to be considered the great CURATIVE AGENT of nostalgia in the field.*" Theodore J. Calhoun, *loc. cit.*, pp. 131-32.

<sup>1</sup> Hall, G. Stanley : *loc. cit.*

and languid and sunken in their sockets. The face is anemic, the whole body begins to emaciate; the pulse is irregular and weakened, heart palpitates, temporal arteries throb. The mouth is dry and sticky. Nervous dyspepsia is very common, more often accompanied by diarrhoea, sometimes by constipation, ending in an absolute refusal to take food. There is incontinence of urine, spermatorrhœa, menstruation may be checked or suppressed altogether. Sexual functions are dulled. Pulmonary phthisis is sometimes mistaken for consumption (case 16). In a word, anabolic processes gradually approach a minimal activity, while the katabolic hasten to the maximal.<sup>1</sup> Sagar says: "It appears that the soul of the nostalgic no longer resides in the body, that it has broken off all commerce with it. All, however, agree to a general bodily phthisis sometimes more or less pronounced in the lungs.

The foregoing<sup>2</sup> facts and considerations impress one that nostalgia is a very fundamental reaction of an organism to fairly describable groups of stimuli. These groups are *primarily*, it seems to me, the absence or loss of the FAMILIAR, the presence of the STRANGE and UNTRIED, and *secondarily* restricted liberty, change of food, habits of life and the like. The first group, especially, will engage us here.

Cases like 9, 10, 18 and 19 have suggested, what appears to be a probable solution—at least a point of view permitting legitimate speculation. Faintness, a dazed feeling, nausea and dizziness are the well known disorders of seasickness and vertigo.

Seasickness<sup>3</sup> is caused by a derangement of the nerve centers that control the equilibrating mechanism of the body. The sense<sup>4</sup> of equilibrium is furnished by every possible bodily sensation—both kinæsthetic and sensory. To retain<sup>5</sup> this sense, it is necessary that the information, derived from whatever source, should harmonize. Disturb the harmony and vertigo immediately ensues. Contradictory impressions not only disturb but often stop the equilibrating functions. Nowhere are these confused sensations so baffling as at sea. The point of

<sup>1</sup> Physicians, like Haspel and Larrey, believed that it was caused on the physical side by brain and spinal lesions, cerebral hemorrhages and swellings of the arachnoid membrane, or by gastro-enteric lesions. These views are now discredited.

<sup>2</sup> Calhoun says "Nostalgia is an affection of the mind. It must be treated with that in view." Hack Tuke thinks that it always represents a combination of psychical and bodily disturbances. Sauvage describes it by four words: *morasitas*, *pervigilio*, *anorexia*, *asthenia*, which signify sadness, sleeplessness, want of appetite and exhaustion.

<sup>3</sup> Hudson, W. W.: Cause, Nature and Prevention of Seasickness.

<sup>4</sup> Howell: Amer. Text Book of Phys., pp. 846-47.

<sup>5</sup> Elsner, H. L., Dr.: The Medical News, Vol. LX, pp. 477-80, 1892.

rest (center of gravity) in the human body on a tossing ship is being constantly shifted. Persons unacquainted with these phenomena attempt consciously and unconsciously to make compensatory movements in order to maintain the old habitual land-sense of equilibrium; thus inaugurating a struggle between equilibrium of habit and the equilibrium under novel conditions (sailors are adjusted to this novel sense of equilibrium). These repeated attempts to maintain an *arbitrary* center of gravity as it were, produce seasickness<sup>1</sup>.

Nostalgia, it is true, is not a direct disturbance of the physical sense of equilibration, it appears as a secondary effect. The patient has, however, lost his psychical orientation. Just as the seasick patient has his center of gravity and consequently his physical plane of reference constantly eluding his bodily adjustments, so the nostalgic has his "psychical plane of reference" — composed of familiar scenes, friends, sense of security and the like — rendered uncertain and bewildering, through his inability to interpret and to enter into familiar relationships with the new world about him. To get on in this new world new adjustments must be made, old brain paths must be dropped and new ones formed. He must fuse with a new stratum. The greater the unfamiliarity the severer will be the nervous shock and stress in trying to make a new adjustment, or to establish new relationships. As we have seen, many do not try to make a "fusion" at all, do not seek a new "plane of reference," do not attempt to build new brain paths, but rather yield passively to their prison-world with wonder, timidity and fear. One experiences the beginnings of this phase of nostalgia on entering a familiar room in which the furniture has been rearranged or a piece taken out, or when one attempts a mechanical performance in a new situation, *e. g.*, writing or eating in a new place at the table, or when one looks into the garden or on the lawn where a conspicuous tree has been cut down.

The shrivelling and contracting effects of nostalgia on the ego are unique. Especially does this seem true of the social ego. In a strange land no one appreciates, applauds and sympathizes with my efforts, my boon companions are gone, I am isolated, cut off, but a mere machine grinding out a bit of the world's work.

#### MIGRANT VS. LOVER OF HOME.

The migrant is cosmopolitan, has manifold interests, and finds profitable objects and kindred spirits in a variety of situations.

<sup>1</sup> For a detailed description of the anatomical and functional relations of the organs (believed to be) involved in vertigo. See Dr. E. Woakes, *Brit. Med. Jour.*, Vol. I, pp. 801-41, 1883.

McBride: *Medical Times*, London, 1881.

H. S. Lee: *Jour. Phys.*, Vols. XV and XVII, 1894-95.

Howard Ayres: *Jour. Morph.*, Vol. VI, 1892.

He may be found in the commercial, speculative, daring, progressive, macroscopic interests of the world. The lover of home is provincial, plodding and timid. He is the world's hod-carrier. His interests are identified with the conservative and microscopic affairs of society.

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